

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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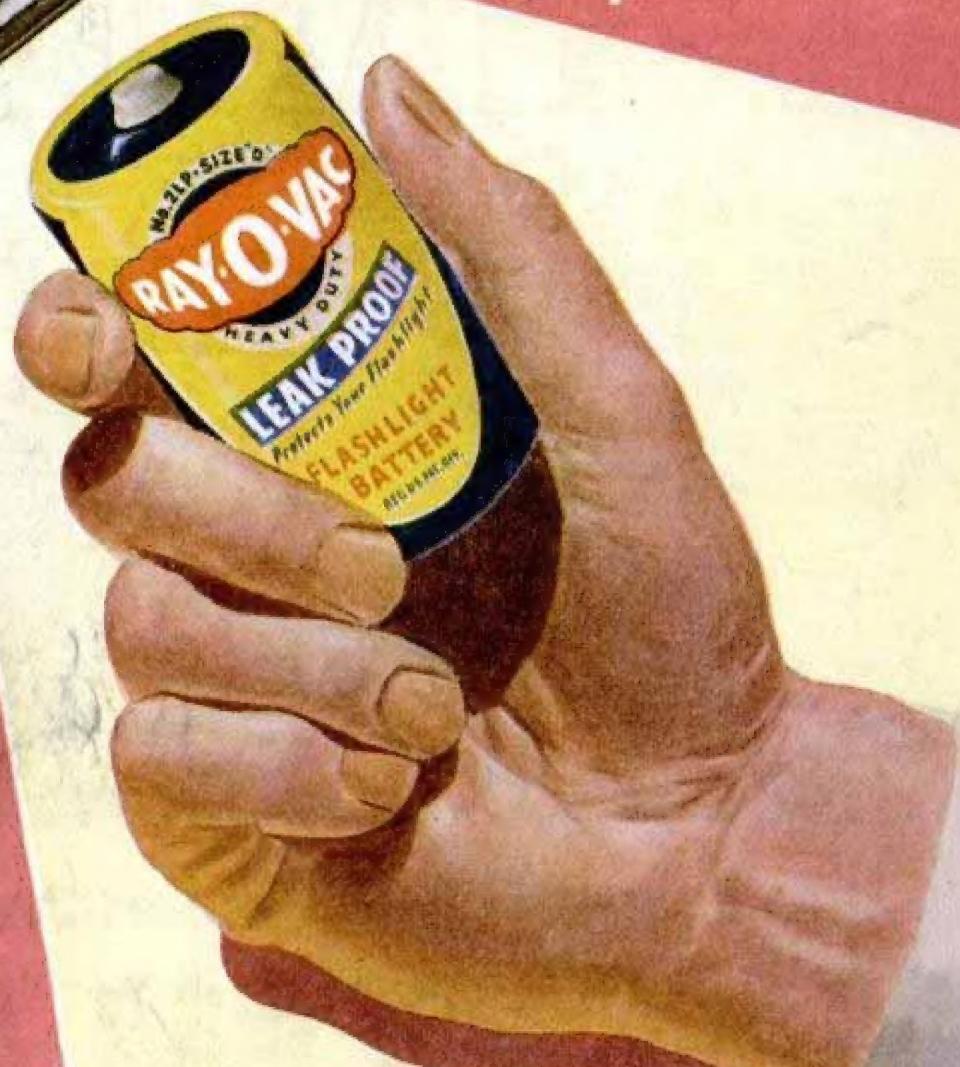
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APRIL
1946
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FLYING WATER BUGS
PAGE 96

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LEAKPROOF FLASHLIGHT BATTERIES

Stay Fresh
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*Order these new tires
now for your car*

THE two tires you see here have spent their entire lives together—running on the same car. They have covered exactly the same number of miles, under the same driving conditions, over the same roads. They were shifted from wheel to wheel so that there could be no possible advantage for either.

The one on the right is a prewar tire. The one on the left is the new B. F. Goodrich Silvertown. Just look at the difference. And this is no isolated case. These new tires have passed nearly 17 million miles of

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The new tire has a wider, flatter tread that puts more rubber on the ground, spreads the wear over the whole tread surface. And even wear means longer wear! The tire body, or carcass, is stronger, too . . . made that way by using tougher cords and more of them.

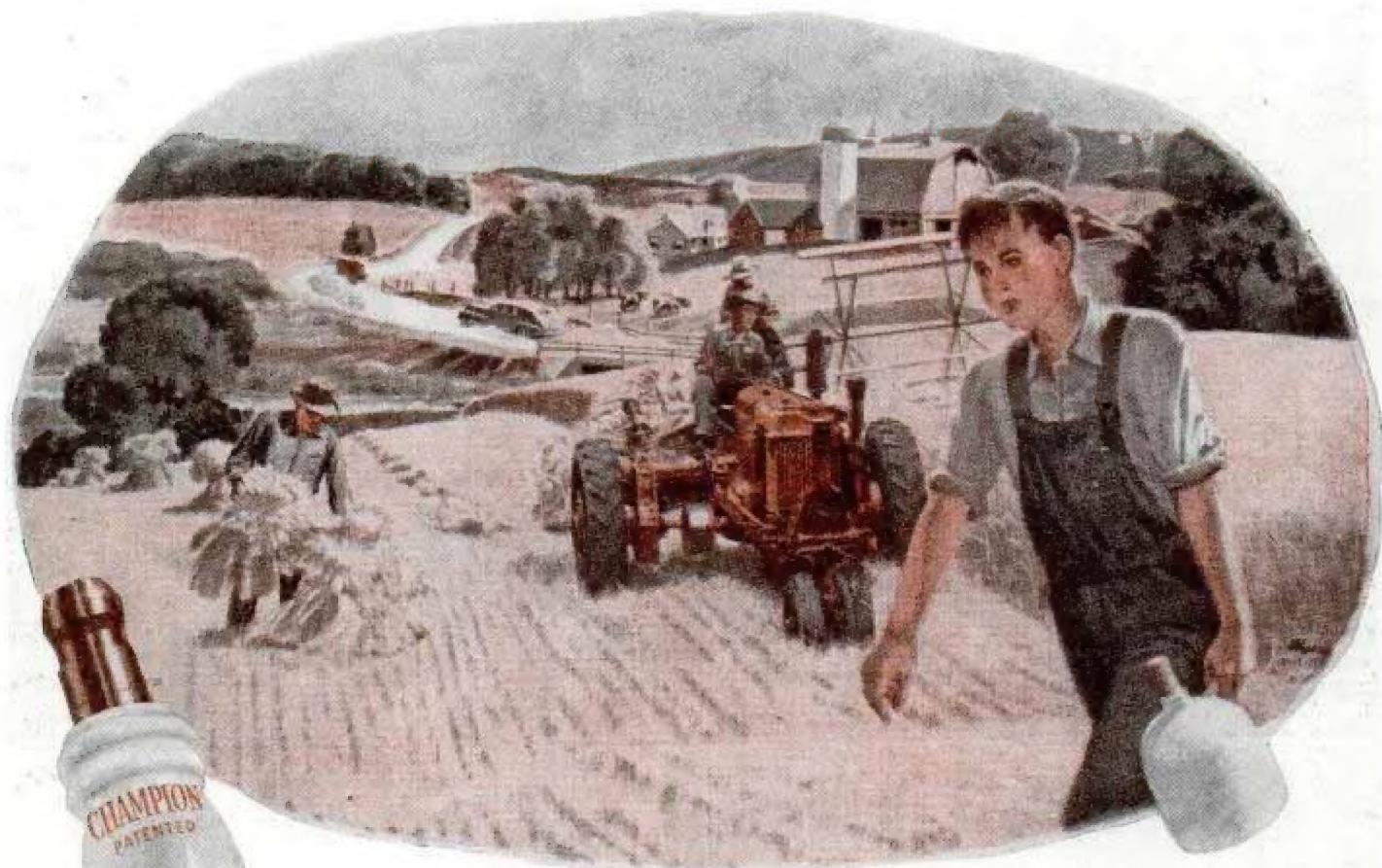
You can forget all your worries about "wartime tires" if you get one

of these new B. F. Goodrich Silvertowns—they've proved that they will outwear prewar tires. They've passed the toughest tests anyone can give them in the laboratory or on the road. Supplies are still limited, of course, but we're making and shipping these new tires every day and hope to have much larger quantities in the hands of most dealers within the next few months. *The B. F. Goodrich Co., Akron, Ohio.*

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THEY'RE DEPENDABLE!

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Survey after survey has proved that farmers prefer Champion Spark Plugs in overwhelming majority—powerful evidence that you can depend on Champions for better performance in every engine. **Champion Spark Plug Company, Toledo 1, O.**



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Popular Mechanics Magazine

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H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

Next Month



BYRON NELSON, greatest golfer in history, "tees off" with the first of a series of articles on "The Mechanics of Golf" in our May issue. The man who has won more important tournaments than any other golfer takes time out to answer the query of fans from coast to coast: "How do you do it?" The first article deals with wood shots and he tells with pictures and text how he grips a club, the proper stance for best results, and how he developed his famous swing. The series is a "must" for golfers and is good reading for anyone who wants to find out what makes a champion tick.

HOT DOGS! Frozen foods! Gasoline! Cuppa coffee! Soup! Ice cream! Step right up to the coin machine and help yourself. "Half a Billion in the Slot" (per year) tells what's in store for Americans in the coin machine age.

SOME "Do's and Don'ts of DDT" are told in an authoritative article based on information from the Department of Agriculture.

THOSE vacation photos and postcards can be shown on a screen or wall with a homemade slide projector described in the May Craftsman section. The projector also is useful for studying diagrams or building plans.

Volume 85

APRIL 1946

Number 4

Managing Editor.....	Roderick M. Grant
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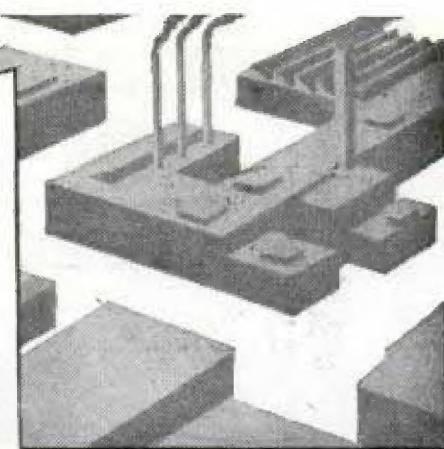
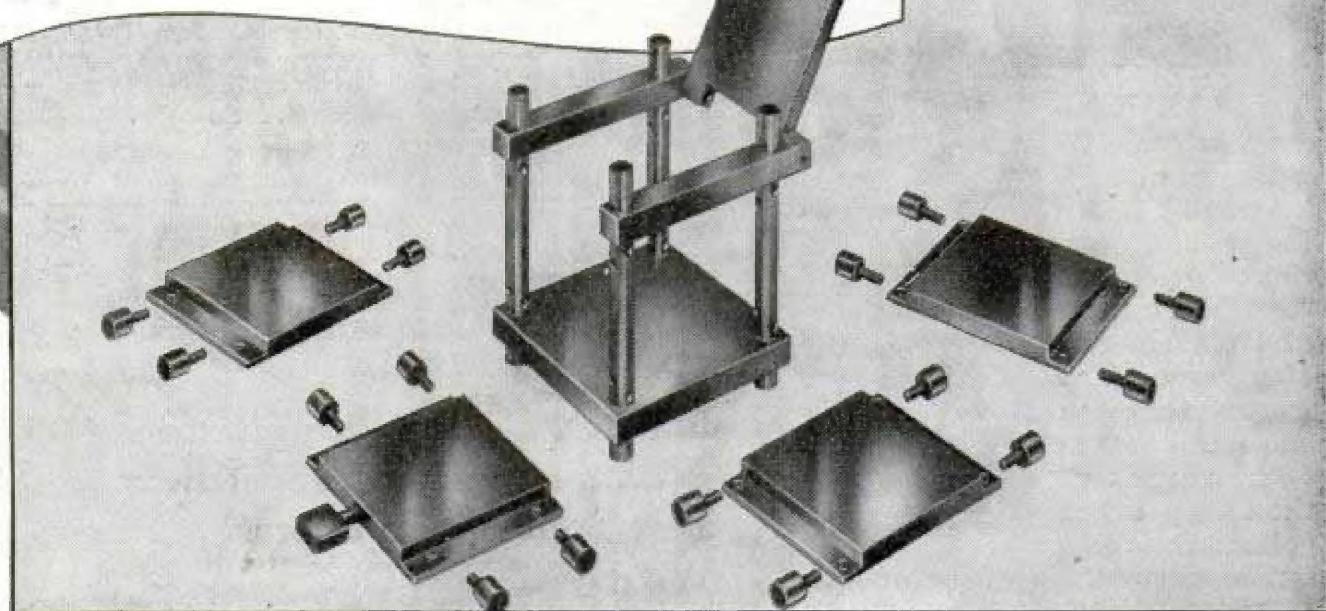
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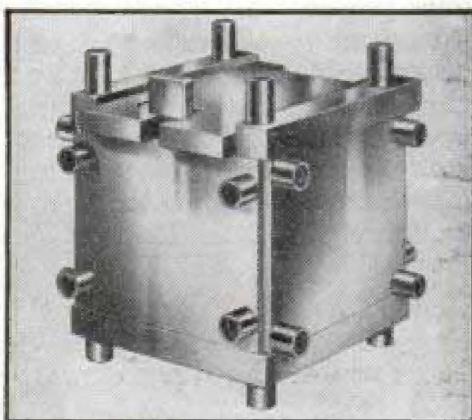
The Drillet Box Jig makes special tool design for drill jig unnecessary. Saves up to 75% of the time and cost of building a jig body. By merely turning thumbscrews and raising leaf, parts may be quickly loaded or unloaded. The jig may be used on all six sides, taking advantage of its full capacity.

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Scores of industrial plants report that they have stepped up their workers' morale and efficiency by making chewing gum available to them.

You can get complete information from The Chicago Drillet Corporation, 920 S. Michigan Ave., Chicago 5, Ill.

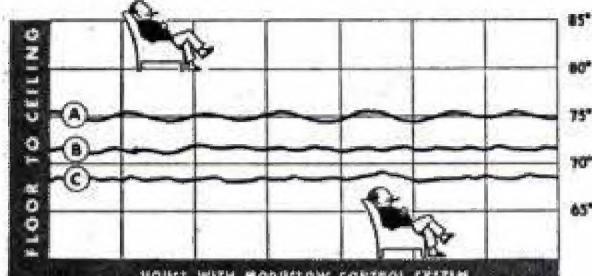
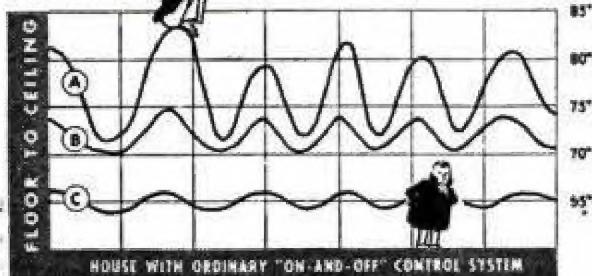


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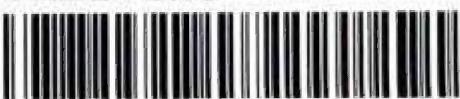


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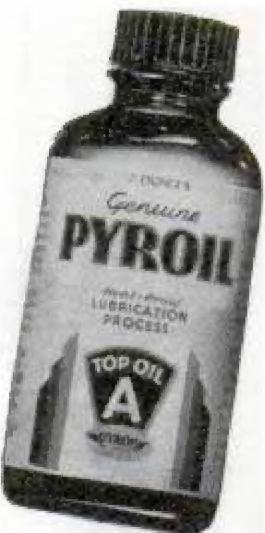
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Manufacturer's name and address appear in parentheses directly after items believed by us to be commercially available

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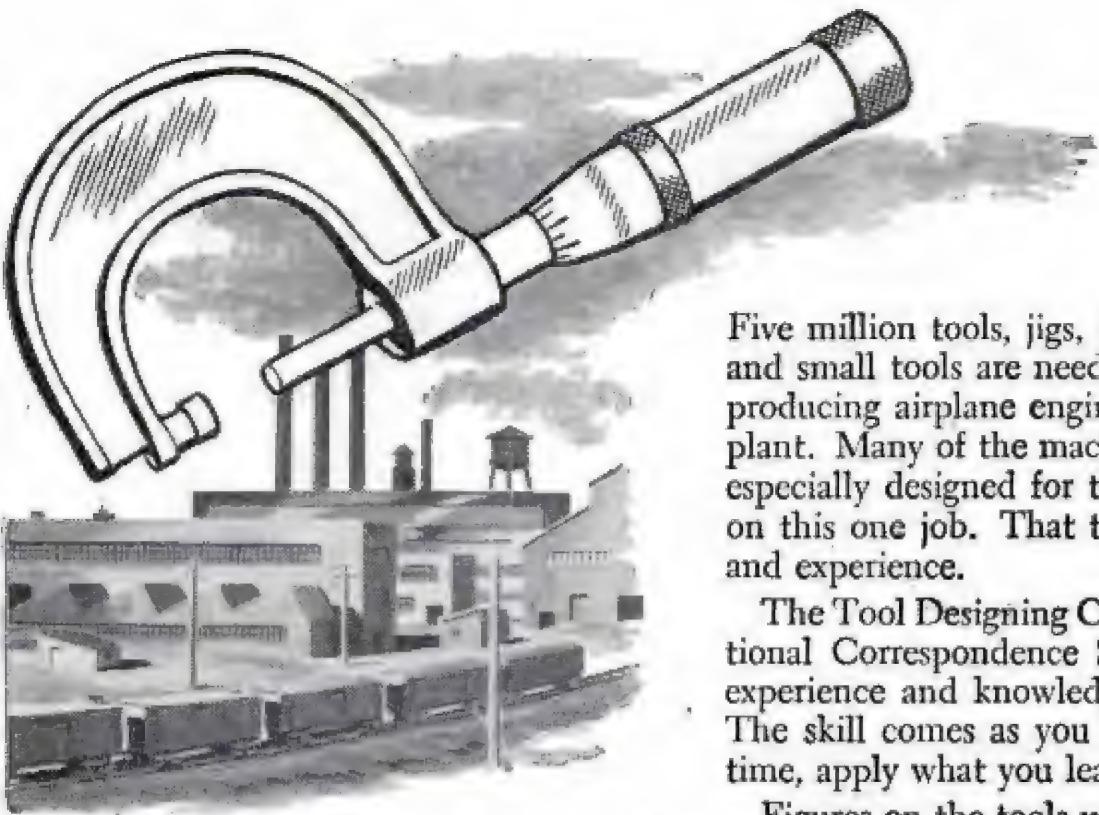
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Five million tools, jigs, dies, fixtures, gauges and small tools are needed by the machines producing airplane engines in just one U.S. plant. Many of the machine tools had to be especially designed for the work to be done on this one job. That takes real knowledge and experience.

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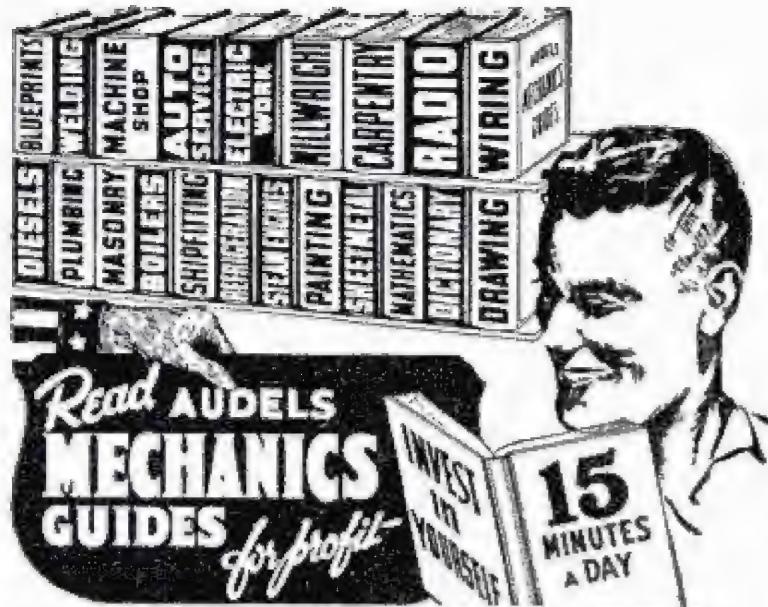
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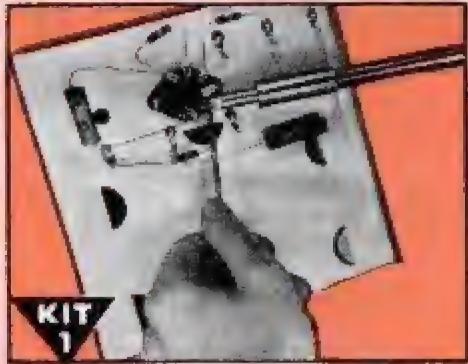
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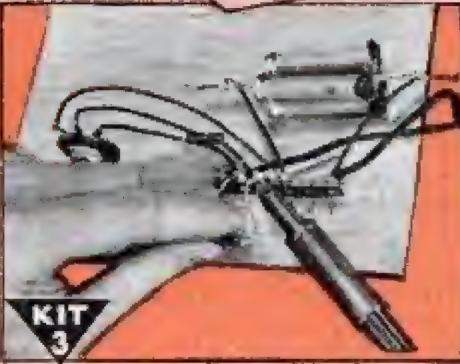
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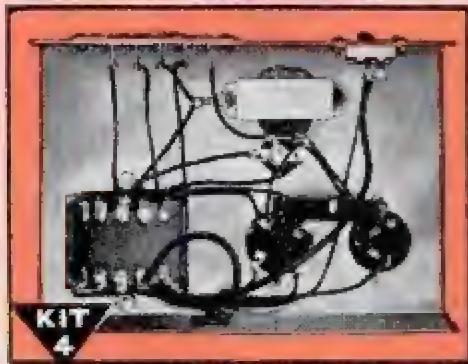
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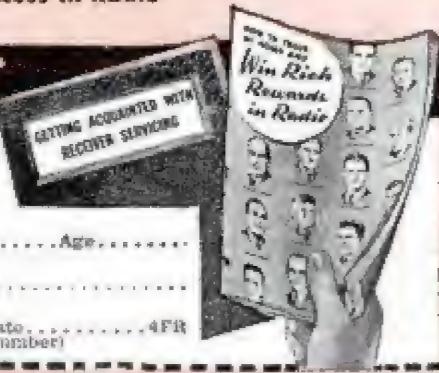
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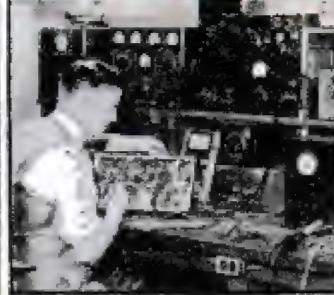


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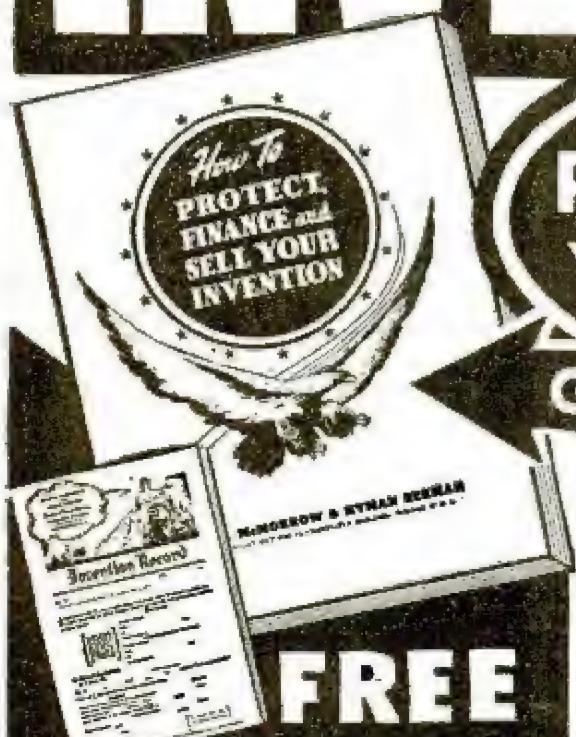
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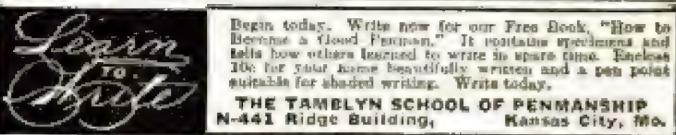
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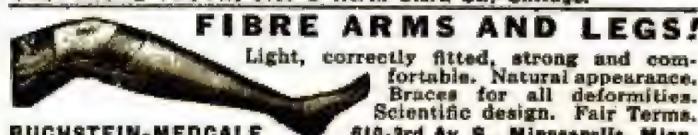


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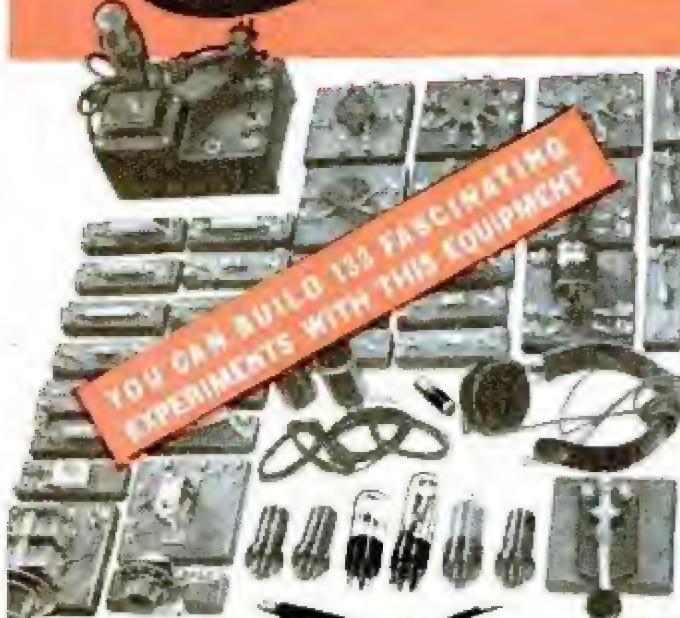
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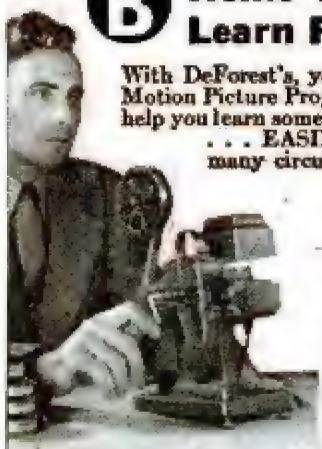
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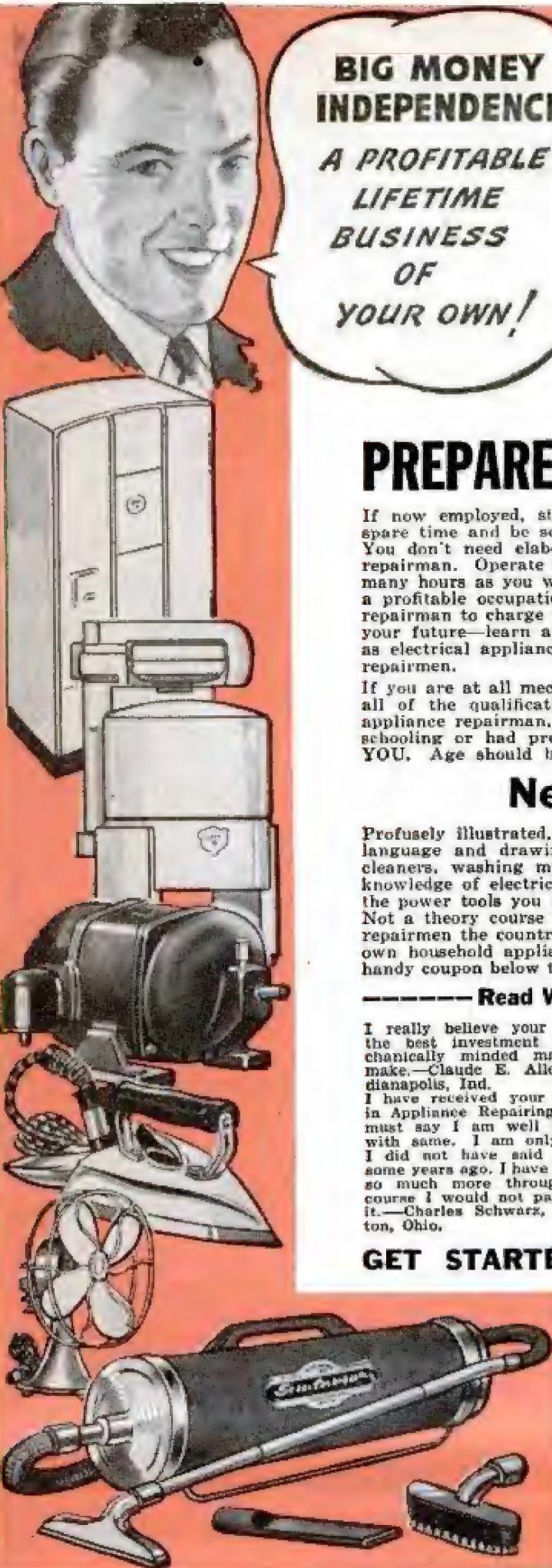
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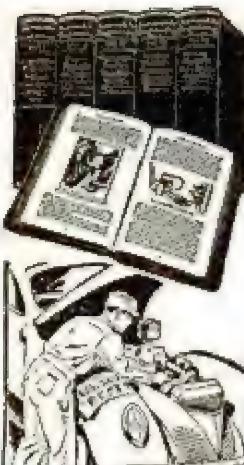
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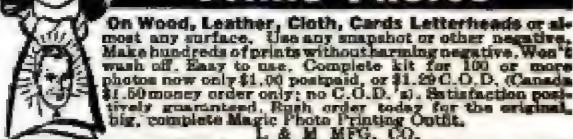
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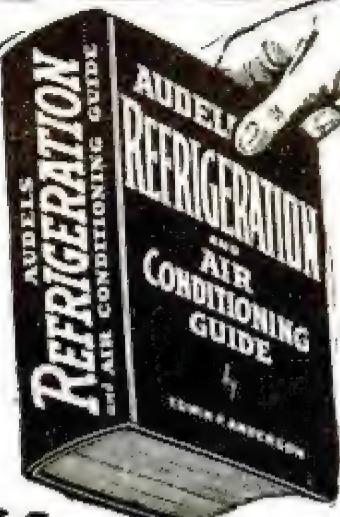
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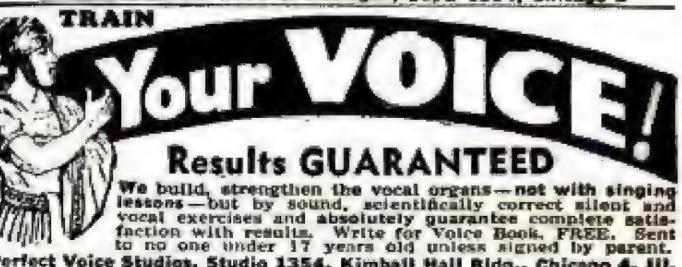
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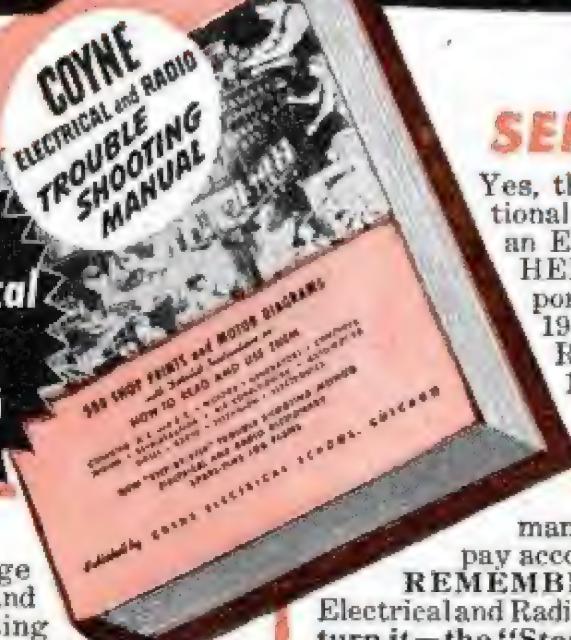
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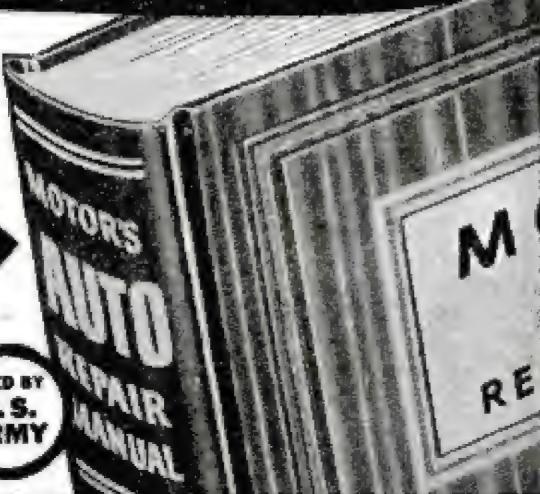
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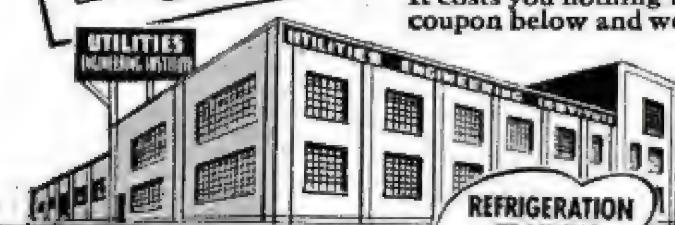


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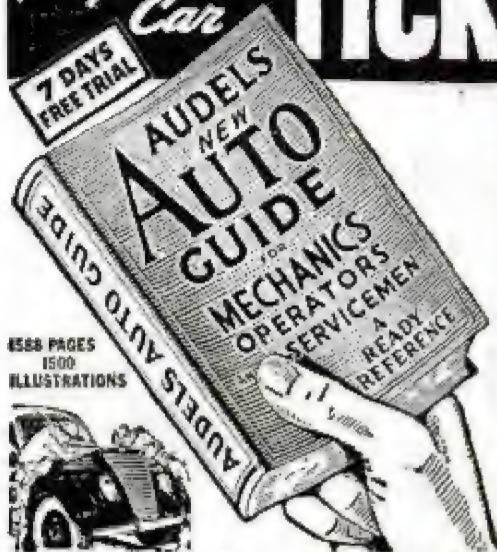
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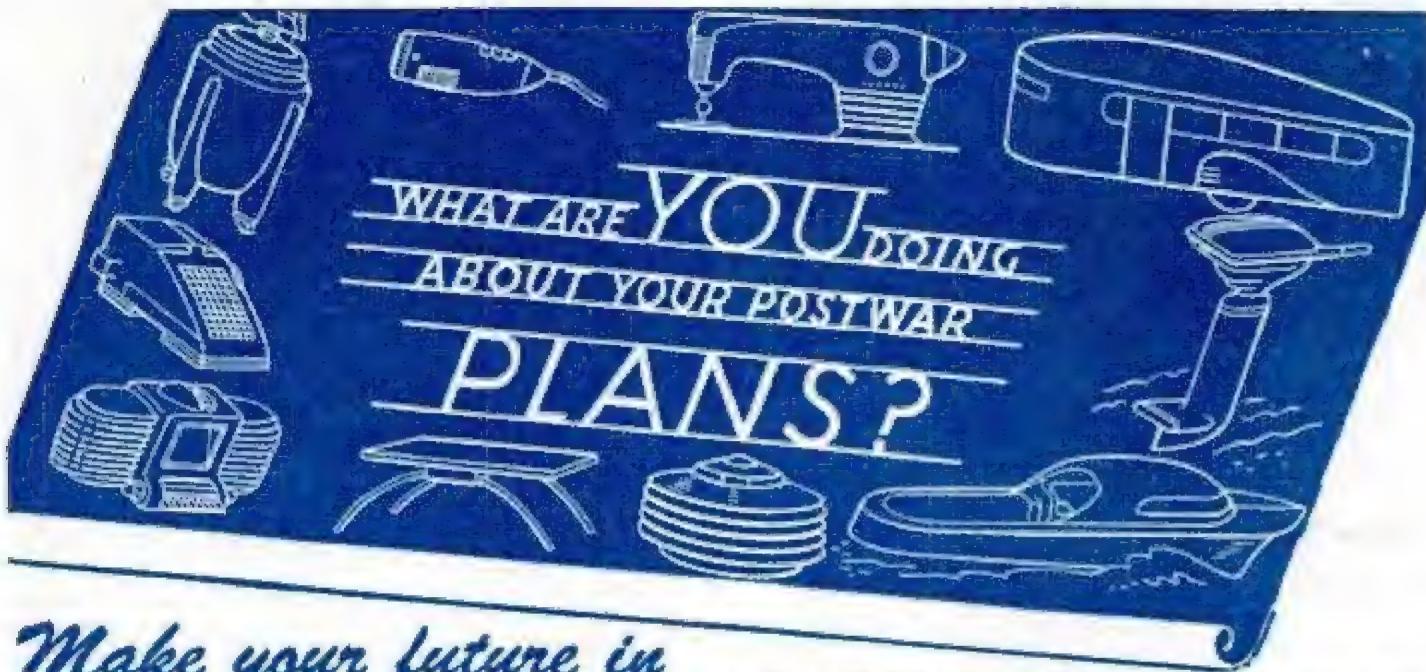
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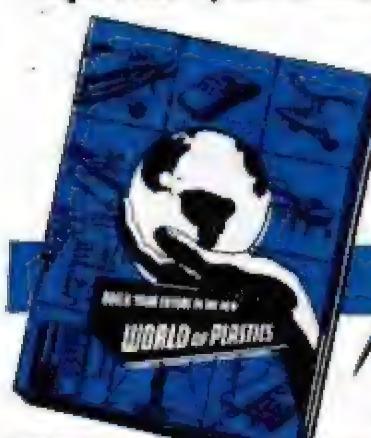
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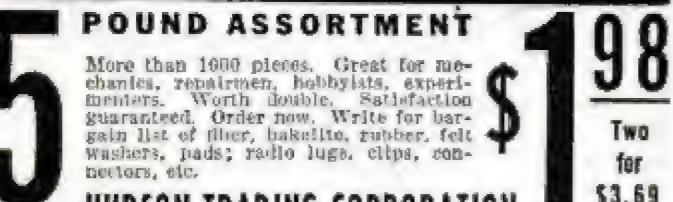
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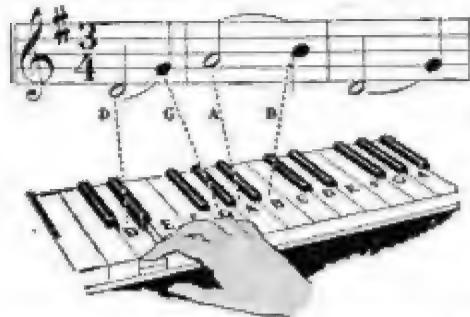
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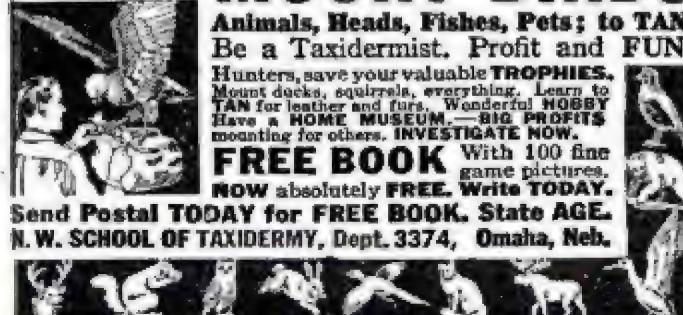
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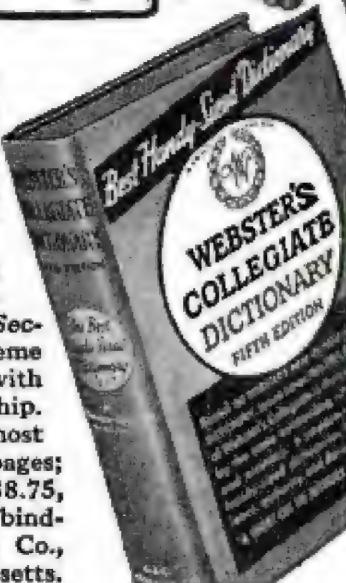
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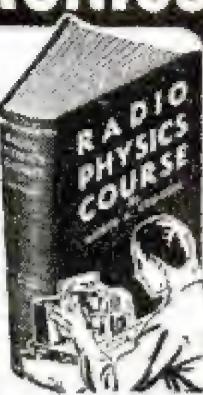
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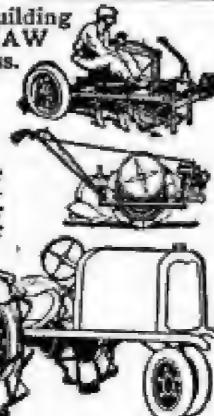
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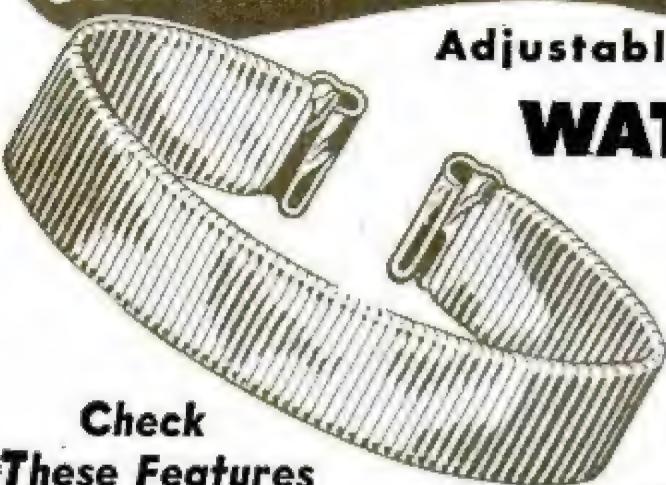
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May issue on sale May 1st

F. W. Johnson, Manager, Classified Advertising
Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois

1455

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1455

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PHOTOGRAPHS, World's finest automobiles. List 10c. Box 1028, Minneapolis, Minnesota.

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BEAUTIFUL Chrome foglights, sent postpaid anywhere in U.S.A. \$7.95 pair. Rich cloth seat covers \$9.95 postpaid, state make, model, year of car. Send check or money order. Gem Distributors, Box 261, Stratford, Conn.

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GENUINE Moto-Scoot parts. Complete wheels, tires, tubes, 4-00x7, 3-50x6. AMSCO centrifugal clutch. Windshield, side cars. All other parts and accessories. Write for parts list. Also genuine engine parts for Briggs and Stratton, Laison, American Moto-Scoot Co., 1319 W. Carroll Ave., Chicago 7, Ill.

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MOTORCYCLES—How to Manage Them. 288 pages, 175 illustrations, drawings, 29th edition now available. Read and become better motorcyclist. Expertly written. \$1.50 postpaid, Clymer, 2125 W. Pico, Los Angeles 6, Calif.

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MOTORCYCLE Camo ground for speed and power. For information write Harold Schaller, 247 West Main, Turlock, Calif.

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PARTS, Accessories, pistons, chain Harley Davidson motorcycles. George's, P.O. Box 114, El Paso, Texas.

LARGE Stock Indian parts. Expert motor rebuilding. Indian Motorcycle Sales, Kansas City 1, Mo.

BUILD America's lowest priced motor-scooter speedster! Complete plans, specifications, \$1.00. Big list used motors, etc., included free! Motor Supply, Box 1682-CS, Toledo, Ohio.

FLOYD Clymer's popular motorcycle, automobile books. See advertisement under Automobiles! Clymer, 2125 W. Pico, Los Angeles 6, Calif.

TIRES, Tubes, wheels, for industrial trucks, carts, wheelbarrows, scooters, midget cars, coaster wagons. Nationally known makes, first-line quality. Sizes 8" to 18" o.d. in 2, 4, and 6 ply tires, separate inner tubes, heavy duty demountable wheels. Also caster forks, straight and swivel types. Free illustrated circular and prices. Jahant Co., 636 East Exchange Street, Akron 6, Ohio.

ENGLISH "Motorcycling" Magazine. Interesting, educational, foreign motorcycles. Racing, new-old models, advertisements. 50c sample copy. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

PLANS. Scale drawings, specifications, illustrations for building attractive motor scooter complete \$2.00; plans electrically driven bicycle \$1.50. Postpaid. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

TIRES And industrial wheels, suitable for scooters, wheelbarrows, farm equipment, etc. All sizes. Bicycles and accessories. Largest assortment in America. Send dime for list. Cycle Transport Company, 1241 So. Michigan Ave., Chicago 5, Illinois.

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P-47 AIRPLANE Jetison gasoline tanks—streamlined 10½ feet long, 28" diameter, 165 gal. capacity, constructed of 20 gauge terne coated steel. Ideal for making boats, bob sleds, midget autos, etc. Price \$17.50 per tank or \$12.50 per tank in quantities of 3 or more. Special quantity discount to dealers. Ramona Manufacturing Company, Ramona Park, East Grand Rapids, Michigan.

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AERO-SLED Blueprints, open job, \$3.00. Adastik Bros., Grand Rapids, Mich.

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LIGHTPLANE! How to build them. Illustrated circular 20c. Craftsman Book, Box 1183-P1, Milwaukee 1, Wis.

JET Propulsion experiments. New principle to drive boats, bicycles, model helicopters. Circular on plans. Rush name. Houston Maupin, Tipp City 5d, Ohio.

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PHOTO-ELECTRIC Cells—Generate electricity by light. Operate meters, relays. While they last, \$5.95 postpaid. C.O.D., \$6.25. Star Co., 235 Canal St., N.Y.

FLUORESCENT Lights—Home, Industrial, commercial. Ray, Box 329, Posen, Ill.

MANUAL "Know your multiaxial motors," explains in detail this electric motor. \$2.00. Literature free. Electric Generator Manufacturing Co., 1333 N. Dale St., St. Paul 3, Minn.

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IRON Element and cord set. Plus element for toasters or heaters, hotplates. Three \$1.50. United, 1554 York Ave., New York 28, N.Y.

MOTOR Winding supplies, wire, insulations, in small quantities. Electrical Service, 19165 Gallagher, Detroit 12, Mich.

ELECTRIC Irons \$5.50. "Electro" six-tube ac dc superheterodyne 1946 radios, \$26.25. Two burner stoves, \$6.95. Electric broilers, \$13.95. Heaters, \$4.95. 8" electric fans, \$8.95. 30% deposit. Jeannette Electric Co. Inc., 159 West 23rd Street, New York 11, N.Y.

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ELECTRIC Appliances, every description. Send for circular. United, 1554 York Ave., New York, N.Y.

NOW Available! Electric quick freezers for home and farm. Immediate delivery! Write for free catalogue. Modernlite Company, Box 1167-B, Baltimore 3, Md.

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NOW—Repair your own electrical appliances with Chanite Self-welding Electrical Heating Element Flux. Instructions delivered. price \$1.00. Stick form 25c ea. \$2.00 doz. Chanite Sales Company, 914 South Main, Fort Worth, Texas.

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ACETYLENE Welding outfit like new: arcwelders, welders manual, \$1.60. Eagle Welding, Dept. PM, 5085 Broadway, Chicago 46, Ill.

BUILD 110 Volt a.c. welder. Plugs in socket. Plans \$1.00. Easily built. Franks' Projects, Box 555, Louisville, Ky.

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OKINAWA "Flame thrower" slip-on soldering tip for fender men. Fits all torches. Postpaid anywhere in U.S. \$2.35. L. E. Kelly, 1947-19th Avenue, San Francisco 16, Calif.

WELDING, Cutting, aircraft welding and soldering equipment. Electric arc welders. Superior Oxy-Acetylene Co., Hamilton, Ohio.

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BUILD D.C. arcwelder without rewinding armature. Pans \$1.00 each. 25 to 600 amperes from automotive d.c. motors, light plant generators, automobile starter-generators. Welders Club, AB-3432, Chicago 54.

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BUILD Quickchange gear box for Craftsman 12", Atlas 10" lathes. Adaptable to others. No castings. Complete drawings, \$3.00. Stevens Engineering, 2804 Military, Los Angeles 34, Calif.

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GOVERNMENT Surplus speed reduction units. Brass gears in Oilite bearings. 133:1 and 66.5:1 ratios. Each \$1.00. Box 112, Russellville, Ind.

GEARS For inventors, experimenters, model makers, schools, work shops, laboratories, etc. Government surplus made of brass, bronze, dural steel and stainless steel. 12 matched pairs; 24 gears, bevel, spur and ratchet. List price \$12.00, our price, \$2.50. 25 matched pairs; 50 gears, includes larger gears, also sets of worm gears. List price, \$30.00, our price, \$5.00. 50 matched pairs; 100 gears better assortment, including internal set and worm sets. List price, \$75.00, our price, \$10.00. Limited quantity. Order now. Write for our bulletins on ball bearings, rectifiers, relays, solenoids, horns and government surplus materials. Met Exchange, 323 Canal Street, New York.

IT'S Easy to build your own metal and woodworking tools from Lewis castings, materials and blueprints—and at savings up to 80%! Lewis mills, shapers, drill presses and other shop tools have ample capacity and performance for home workshop jobs. New catalog—sent on receipt of 10c to cover mailing—describes 23 Lewis tools. Address: Lewis Machine Tool Co., P.O. Box 116, Station A, Dept. M-63, Los Angeles 31, California.

SINE Bars. Simplified, accurate. Instructions included, \$8.75. Capanna, 552 Morgan, Akron 11, Ohio.

ANGLE Plate C.I. 4" x 3" x 3. Ribbed, machine finished 4-sides, \$2.00, unfinished 75c. Model Tool Service, 202 Wood Ave., Rock Falls, Ill.

WAR Surplus, machines, tools, etc. Rush name for free literature. Wayne Engineering, Greenville 1, Ohio.

PATENT Equipment sharpens pipe wrench jaws in your own shop or mount in car trunk and travel. Very profitable. J. C. Moore Industries, Box 234, Fredonia, Penna.

HARDWARE. Tools, saw mandrels, model and pattern supplies, drills, taps, jeweler saws, screws, steel, brass. Catalog 10c. Terek, 6304 Patterson, Chicago 34.

BUILD II! Circular saw and drill press. No castings, pipe fittings. Two simple plans. Complete, \$1.00 cash. Western Colorado Sales Co., Box 584, Grand Junction, Colorado.

BUILD Your circlesaw, lathe, drillpress, and bandsaw from castoff parts! Plans, specifications, for all four, 25c. Allied, 2671 Algonquin, Toledo, Ohio.

CHANGE Any 1/2 inch shaft motor to power grinder or polisher with Greenleaf arbor. Arbor slips on motor shaft, takes any wheel with 1/2 inch hole. Only 70c postpaid. Money back guarantee. Send check or money order to Greenleaf Mfg. Co., Paoli, Penna.

LATHES Owners—Genuine "Accur-Craft" die and tap holders. Designs, 25c each. Accur-Craft, Box 3351, Los Angeles, Calif.

MORE Machine shop tools released for private industry. 13" x 13" Loose change-gear lathes, \$140. 16" x 16", \$180. Medium size Brown and Sharpe and other turret lathes, \$110. Bench miller, \$110. Motorized universal grinder, \$325. 28" Colburn boring mill, \$325. Small Blout tool grinders, \$55. Drill grinder, \$140. Conversion Parts Co., 278 Adams St., Boston 22, Mass.

MAKE Circular saw yourself. Prints, information, 25c. L. Basquin, Grand Rapids 3, Mich.

HANDEE Tool, 1000 uses. Grinds, drills, polishes, etc. 25,000 rpm. ac. dc. 7 accessories. Circular free. Appliance Mart, 21-P, Castine, Bangor, Maine.

DRILL Grinder for twist drills \$2.95, and other craftsman's tools. See ad on page 266.

EXPERIMENTERS — 400 Valuable new springs, 75 kinds, numerous sizes, 10,000 uses, \$2.00. Deluxe assortment, \$3.00. Jumbo, \$5.00. Guaranteed. Technico, Box 246-A, West Hartford, Conn.

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150 AMPERE Generator for welding \$75.00. Extra flexible cable, 8 ft. lengths \$2.75. Other bargains. Butler Electric Company, 1885 Milwaukee, Chicago 47.

COMPARE Our catalogue on engines, etc., 10c. Howard-A3, 2117 N. Ashland Ave., Chicago 14, Ill.

WIZZ Electric motor: Assembles in a jiffy. Operates on flashlight cell. All parts complete. Instructions. Send 25c, plus 5c postage. Eltro, Box 171B, Deer Park, N.Y.

ELECTRIC Motor Course giving instruction on rewinding, connecting and testing single, two and three phase motors. Clearly written in everyday, non-technical language. Illustrated throughout. Especially recommended for the electrician interested in learning the electric motor trade. Prepaid \$2.00. Satisfaction guaranteed or remittance refunded. Educational Advancement Co., Dept. L, Lakewood, N.Y.

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MOTOR Controls and protective devices. A book filled with data and connections for drum controls and starting devices such as used for electric locomotives, cranes, elevators, machine tools, multi-speed two and three phase motors. Also included are relays of various types. DC motor and meter connections. Prepaid \$2.50. Satisfaction guaranteed or remittance refunded. Educational Advancement Co., Dept. L, Lakewood, New York.

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BUILD A boat: Brooks knock-down parts saves time and money. Simple as A B C. Outboards, inboards, sail and racing boats. Send 10c for complete literature. Brooks Boat Company, Dept. PM, Carrollton, Michigan.

BUILD 16' Cabin cruiser. Outboard. Simple to build. Blueprints \$3.00. 12' Fishing rowboat. Blueprint \$1.00. 15' outboard-towboat. Blueprint \$1.00. 18' Canadian canoe. Blueprints \$1.00. Strachan Boat Shop, Howard 2, Kansas.

BUILD \$200 Boat for \$25 of surplus material. Looks like wingless seaplane. Quickly constructed, no welding, caulking, nails. Blueprints \$1.00. Blueprints, 3167 Madison, San Diego 4, Calif.

ATTENTION Sportsmen! Make kayak from complete easy construction kit. Literature. Fla-yaks, Dedham, Mass.

SAIL Your canoe—build the rig. Instructions, \$1.00. Gee, 1211 Frisco, Far Rockaway, N.Y.

10 OR 15' Folding Kayak plans \$1.00. Folder, 4015-F Oketo, Chicago 34.

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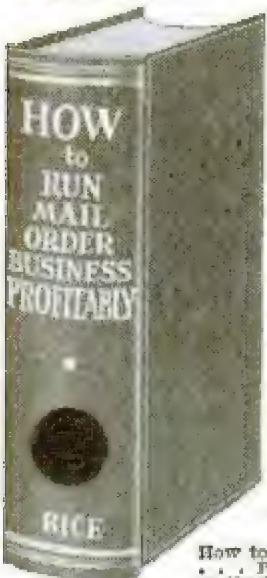
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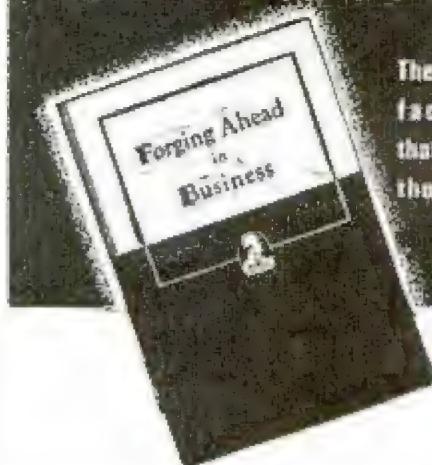


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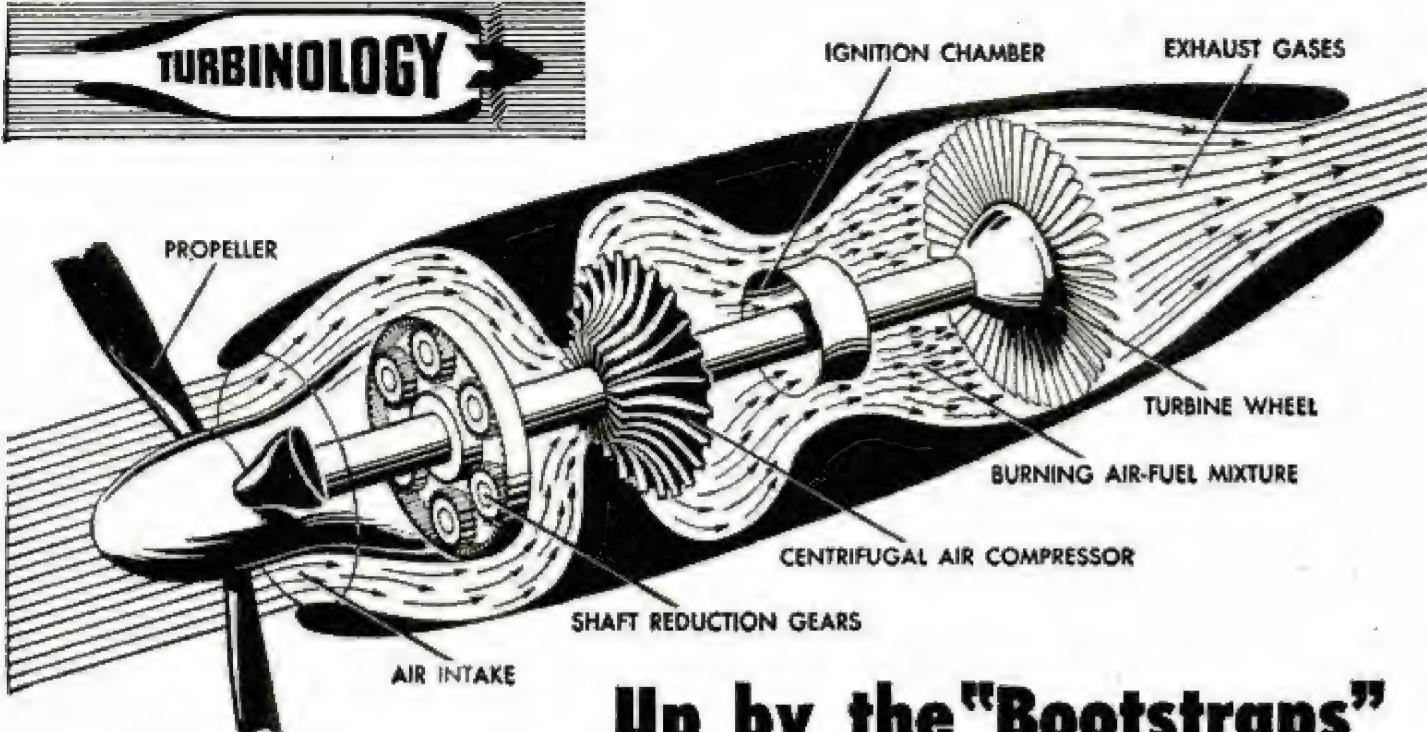
By Ross C. Cramiet

Here's an introduction to leathercraft that tells exactly what to do and how to do it, to make some clever and useful articles like bookmarks, key cases, key holders, coin purses, comb case, belts, book cover, etc. Every step in the process is so clearly set forth in picture, drawing, and easy to understand language that it's no trick at all for the amateur to select the proper material, prepare it for the tooling process, transfer his designs to the leather (a number of interesting designs are suggested by the author), perform the actual tooling, insert linings, lace, and put the final expert finishing touches to the work. **PRICE \$1.25**

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TURBINOLEGY



At first glance, the new Wright Aeronautical propeller turbine for fast, long-range air giants resembles a man lifting himself by his boot straps. For the two main working units in this power plant are a compressor which supplies energy to a turbine wheel, while the turbine wheel in turn drives the compressor.

There's an "X" added, however. The "X" is the heat energy of gasoline or other fuel. Burned with compressed air, it creates a tornado of expanding gases—hot gases powerful enough to spin turbine blades, drive a propeller, turn the air compressor and still have unused force left over to jet out the exhaust for extra thrust.

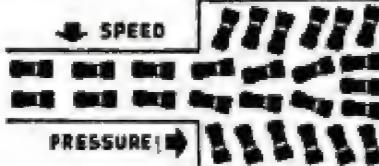
The diagram above shows a schematic drawing of a Wright turbine. From left to right, here's what happens:

Air enters through an intake around the propeller hub. It is snatched up by the blades of an "impeller", the main part of a "centrifugal" air compressor. The air is hurled off the blade tips at high velocity, but without much pressure. Curving passages leading to the combustion chamber slow it down, build up pressure.



Imagine a double-lane express highway, with cars spaced well apart doing 80 miles per hour. That's velocity. If the express highway ends abruptly in a parking lot, the cars pack up bumper to bumper. That's velocity changed to pressure and is exactly what happens to air moving through the compressor of a Wright turbine.

In the combustion chamber, part of the air is burned with gasoline, producing a flame double the temperature of molten aluminum. This raging heat expands the rest of the air. Being compressed, it has further to expand. It's like adding a pinch of dynamite to a steel spring as it is released from full pressure. Just as air caged inside an inner tube blasts through any available opening, so this inferno of hot gases fights to get out into the open. The only way out is through the openings between the turbine blades. On its curved



surface, each blade takes the full impact of this gaseous force.

The only way it can "roll with the punch" is to turn. And turn it does, with all the other blades on the turbine wheel and shaft. Enough power is put into the shaft to drive

the geared propeller and the compressor both. Major part of the power goes to the propeller. The compressor takes only a small part of the total.

That, basically, is the way a Wright turbine works. Some models have different types of air compressors. Models will vary from 5,000 to up towards 10,000 HP. But all will work on the same principle of compressor-combustion chamber-turbine wheel. And all will mean new advances in both military and commercial aviation.

This is one of a series of explanatory ads on the propeller turbine of the Wright Aeronautical Corporation.

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POPULAR MECHANICS

APRIL
1946

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 85

NO. 4

By Aubrey O. Cookman, Jr.

ONE hundred and three ships of war, from the 33,100-ton battleship Pennsylvania down to squat LSTs, will be grouped in a Pacific Ocean lagoon next month for the first of three atomic bomb trials to determine the future of modern seapower. The lagoon's 250 square miles of anchorage will be a mammoth test tube where leading scientists, military experts and government representatives will observe the bomb's yet-unproved effects on naval targets.

Contrary to popular supposition, the tests are not expected to result in wholesale destruction of the entire armada or even a majority of it. Nor will they represent an attempt to demonstrate the fullest destructive power of the atomic bomb. That could be done by filling the air with planes laden with atomic bombs or preparing more powerful bombs. Probably not more than half the ships involved will be destroyed or damaged beyond repair at the end of all three phases of the experiment.

What the experimenters can learn, under the ideal test conditions being set up, is

"Operation Crossroads"

Unmanned Fleet of 103 Ships to Be Target in 3-Phase
U. S. Test in Pacific of Naval Effects of Atomic Bomb



HERE IS THE SETTING FOR



When history's most important explosion occurs on or about May 15 at Bikini Atoll the target will be an assembly of more than 100 unmanned ships totaling approximately 200,000 tons and representing an estimated \$500,000,000. As the atomic bomb hurtles down to its detonation point several hundred feet above the fleet, every conceivable means of gauging the extent, character and effect of the blast will be poised for action. Sturdy steel and concrete towers on surrounding islands will house batteries of movie, television and photographic equipment to record the scene thoroughly, while pilotless planes will be guided even closer in the quest for scientific data and pictures.

At safe distances trained observers in ships and planes will focus their attention on the target area, for what happens in this test, and in the surface and underwater blasts to follow, will have a profound effect on mankind's future.



"OPERATION CROSSROADS"

Here are measurements of major ships designated for atomic bomb experiment:

BATTLESHIPS

	Tonnage	Length (in feet)
Arkansas	26,100	562
New York	27,000	573
Nevada	29,000	583
Nagato (Japanese)	32,720	700
Pennsylvania	33,100	608

HEAVY CRUISERS

	Tonnage	Length (in feet)
Pensacola and Salt Lake City	9100	585
Prinz Eugen (German)	10,000	654

AIRCRAFT CARRIERS

	Tonnage	Length (in feet)
Saratoga	33,000	909
Independence	11,000	610

In addition, the 6000-ton Japanese light cruiser *Sokawa*, destroyers and submarines will be included. There will also be an unspecified number of landing craft and miscellaneous small vessels in the fleet. Although exact placement of the ships has not been revealed, task force officials said that some of the larger ones would be spotted in the center of the target area.

PILOTLESS
PHOTOGRAPHIC PLANE

4780 MILES

San
Francisco

2420 MILES

Hawaiian Is.

Pacific
Ocean

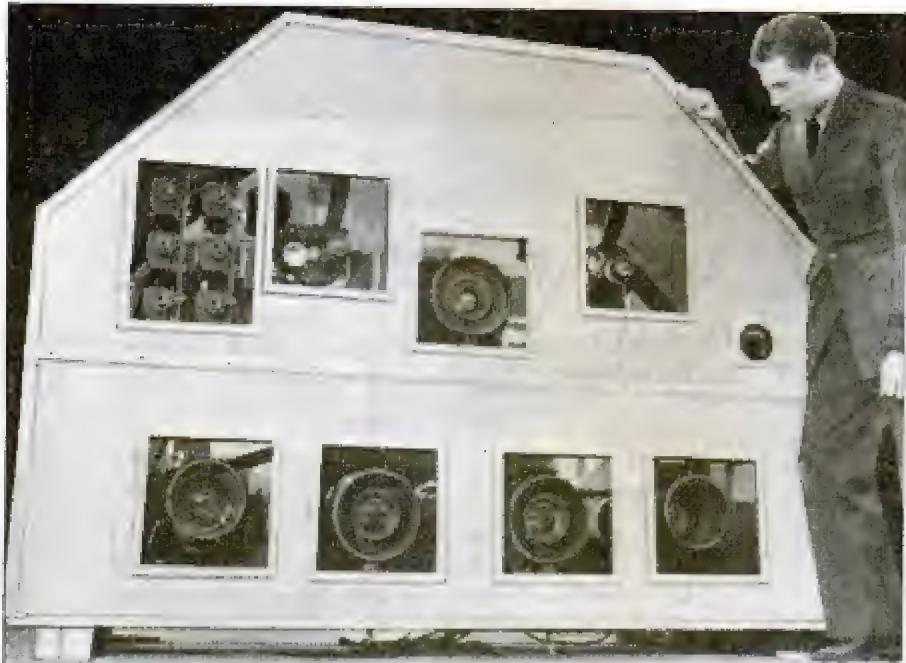
BIKINI
Marshall Islands

DESTROYERS

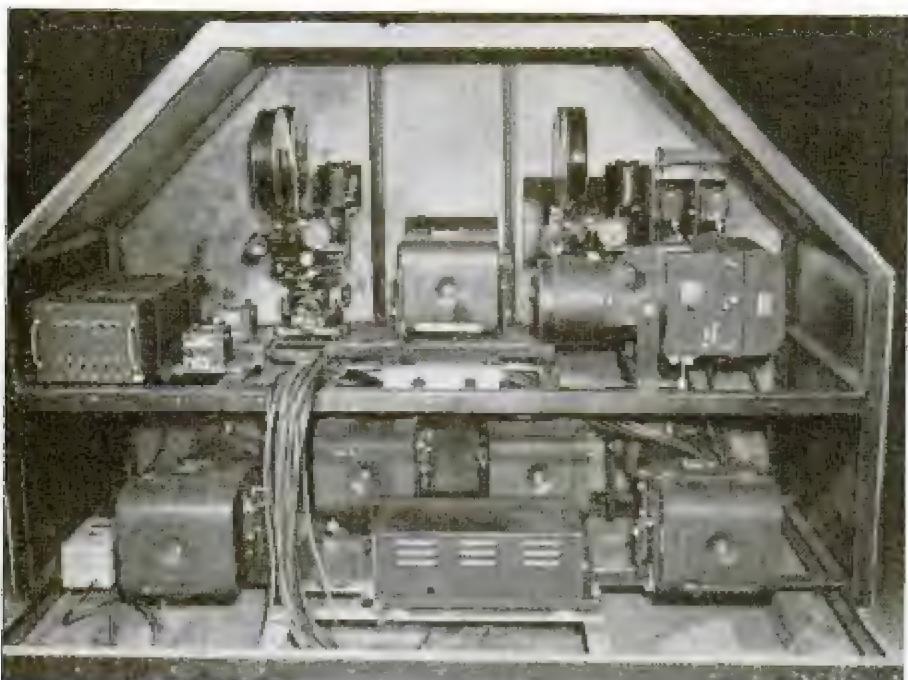
MAYRANT	TRIPPE	STACK	RHINO	BAGLEY	HELM	RALPH	TALBOT
MUGFORD	LAMSON	FLUSSER	CONYNHAM	SMITH	ANDERSON	MUSTIN	WAINWRIGHT HUGHES

BATTLESHIPS

SARATOGA	INDEPENDENCE	ARKANSAS	NEW YORK	NEVADA	PENNSYLVANIA	NAGATO (JAPAN)
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Platform containing batteries of radio-controlled cameras to be stored atop 100-foot steel towers on islands near the blast site. In the event radio control fails the cameras will be operated by a "magic eye" set in motion by the flash of the bomb itself. Below, rear view of the platform



what the bomb can do against an untried adversary. This can best be done if there is evidence, in the form of ships, left to examine. Once a gauge of the bomb's destructive power at sea is reached, it becomes possible to forecast what more bombs or improved versions would do if used in an "all-out" effort against greater numbers of ships. This measurement of potential could go on to determine the probable effect against even more powerfully built ships. The test results may make obsolete many combat theories involving the use of massed ships and radically affect the types of vessels that make up future navies.

Would a ship hit dead center vaporize like the experimental steel tower did in New Mexico? Would thick hulls crack like eggshells? How would ships' superstructures withstand mountainous waves the bomb is expected to create? And what damage would 500 to 1000-mile-an-hour winds do? How would a subsurface atomic explosion compare with a conventional depth bomb? How far-reaching and damaging would be the effect from the terrific heat of the blast? These are a few of the vital questions to be answered.

Although some of the results probably will be kept secret because of their military value, most of the findings are expected to be made public. Facts about the relative placement and loading of the ships, their quantities of ammunition and fuel, whether they have steam up, what hatches and how many are open or closed, and details about the bombs to be used, have not been announced and very likely may never be revealed.

The experiment is being conducted by the United States government, not the armed services, with Vice-Admiral W. H. P. Blandy commanding the 20,000 men of Joint Task Force One who will participate. There will be about 50 ships in the force, exclusive of the 103 target ships. Deputy for aviation is Major General William E. Kepner of the





The USS Mt. McKinley, Task Force One flagship, is fitted with elaborate communications gear for the assignment

Army Air Forces, with Rear Admiral W. S. Parsons, deputy for technical direction, Major General A. C. McAuliffe, Ground Forces adviser, and Dr. R. A. Sawyer of the Manhattan District, technical director.

Bikini Atoll, site of the test, is in the Marshall Islands, 170 miles east of Eniwetok and the same distance northwest of Kwajalein, where the B-29s and other planes taking part will be based. It consists of more than 20 coral islands in a roughly oval pattern enclosing a shallow lagoon, 20 by 12 miles, where the target ships will be anchored. Bikini's 161 residents and about 250 at Eniwetok will be evacuated prior to the experiment. The atoll is 4150 miles from San Francisco and 2442 from Yokohama.

The test begins next month with a single bomb of the type used at Nagasaki, more powerful than the one that killed 78,000 at

Hiroshima; dropping on the assembled "ghost fleet" from a B-29 Superfort. Security prevents official announcement of either the exact altitude of release or the height at which the bomb will explode, but it is estimated that the plane will fly at about 30,000 feet and the bomb will be detonated a few hundred feet above the target.

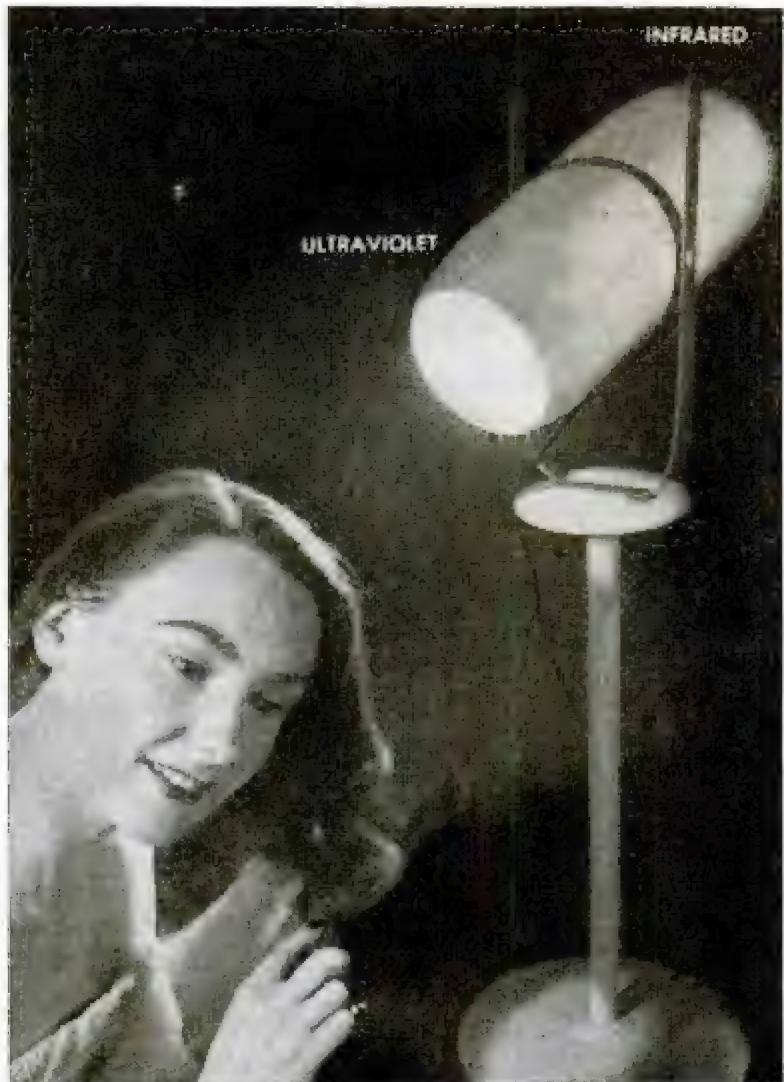
The AAF's famed 509th Composite Group, deliverers of the bombs at Hiroshima and Nagasaki, is training for the test, with the lone plane and crew for the job to be designated on the eve of the flight. Another project of the air forces unit is the preparation of four B-17 Flying Fortresses to serve as pilotless "drones" for radio-controlled flight through the atom cloud after the bomb is detonated. The Forts will carry scientific apparatus to measure the effect of the blast, including bags which will open

(Continued to page 246)

Largest of the target ships is the 33,100-ton USS Pennsylvania, 30-year-old veteran of 13 amphibious landing operations in the Pacific. Her deck will be covered with war materiel lashed there to undergo tests in the atomic bomb experiments



Two-Way Lamp Heats or Tans



Infrared heat lamp and ultraviolet sun lamp are combined in one unit designed by the Westinghouse Electric Corporation for home use. Resembling a streamlined automobile headlight, the adjustable lamp delivers heat rays from one end and "tanning" light from the other. It has a two-way three-position notch. The heat lamp has an operating life of 5000 hours while the sun lamp will provide more than 400 applications. Five minutes under the sun lamp gives a person more sun tan than 15 minutes under a hot July sun.

Depth Bombs Locate Ship Survivors

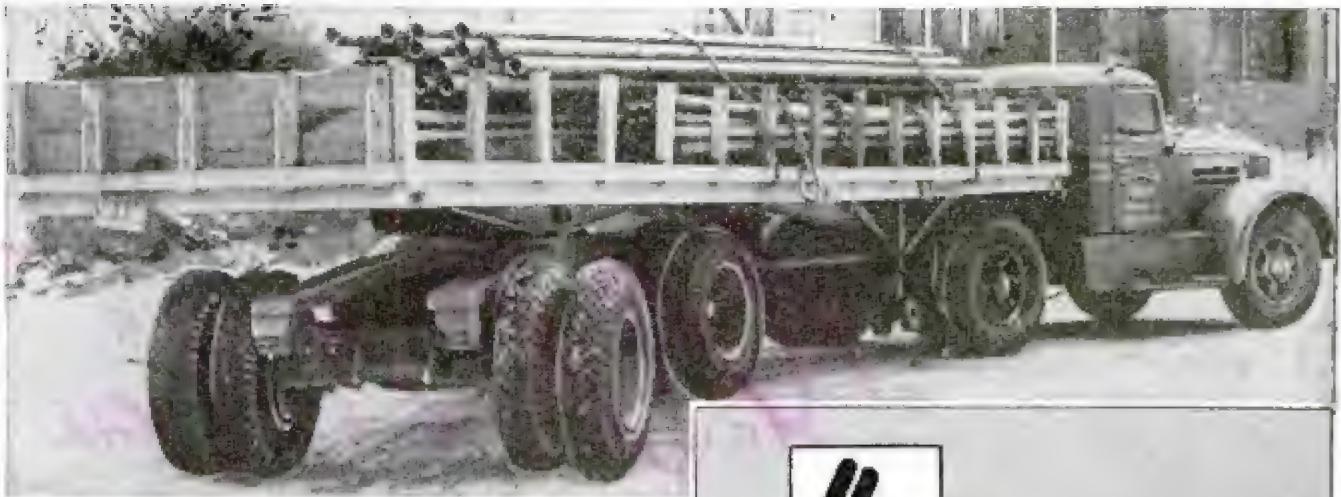
Survivors of ship and plane disasters now can be located 2000 miles from land by means of an underwater sound system developed by the Navy and the Woods Hole, Mass., Oceanographic Institution. Called SOFAR, for Sound Fixing and Ranging, the system

utilizes a recent discovery that there is a "speaking tube" effect between the 2000 and 6000-foot sea depths which permits transmission of sound up to 3100 miles. The survivor drops a five-pound TNT bomb timed to explode at a depth of from 3000 to 4000 feet. The detonation then must be picked up by three widely separated shore stations using hydrophones at the same depth. By comparing the times when the signal was received and referring the differences to special charts, the explosion and the position of the survivor can be located within a square mile in a few minutes. The explosion, which lasts less than a second, is heard for 24 seconds 2000 miles away, building up like the roll of kettle-drums to a sharp finale. This sharp concluding sound permits timing the blast to one tenth second.

8-in-1 Gardening Tool Sharpens Own Blade

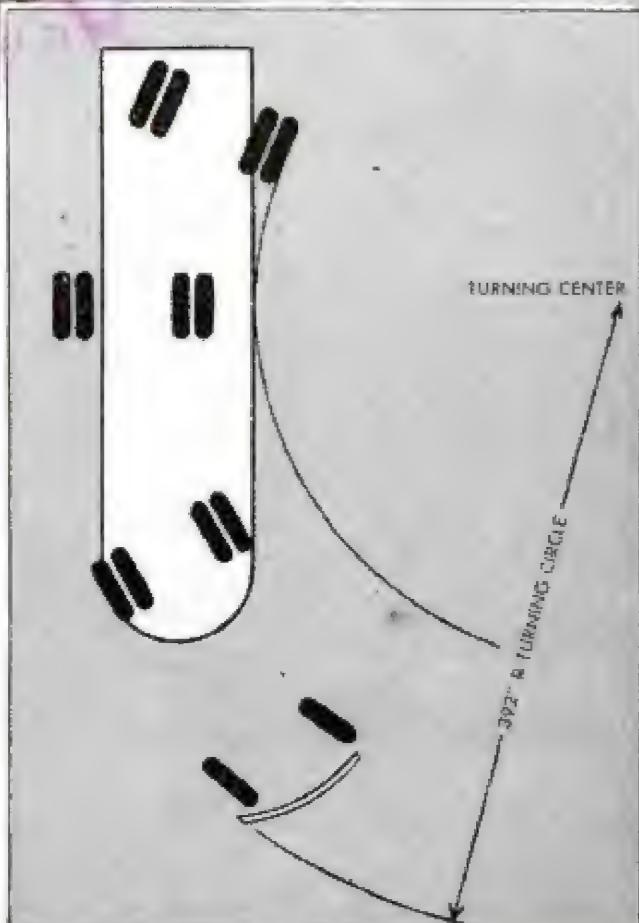
Eight tools in one are provided by an adjustable head for a garden tool. By setting the lightweight steel head in various ways, the device can serve as hoe, rake, edger, shovel, weeder, scraper, furrower or cultivator. The self-sharpening blades are made of chrome steel.





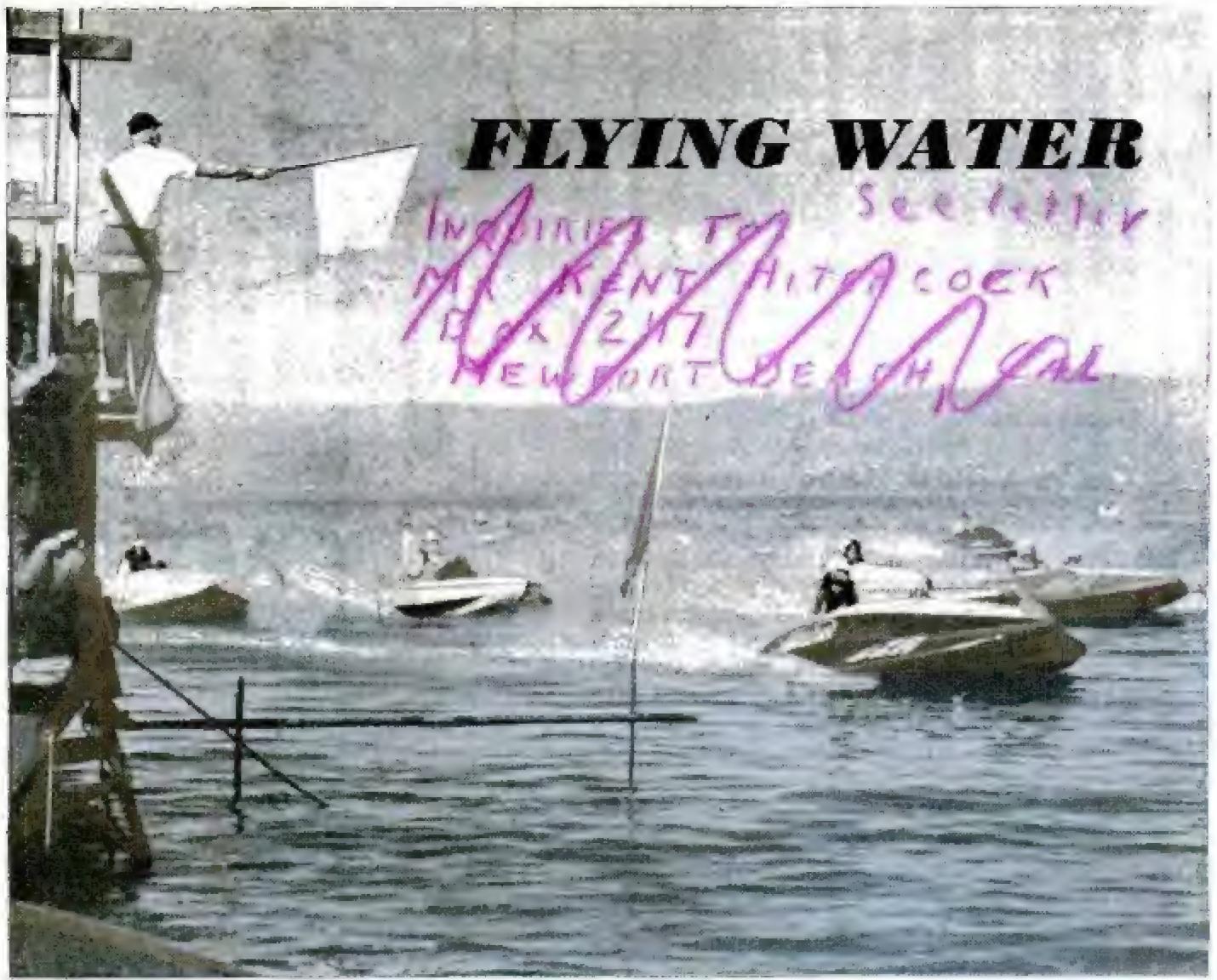
Trailer Wheels That Turn in Sets Allow Increased Truck Loads

Truck trailers, previously limited in length by low maneuverability, can be extended to increase loads 40 percent by a four-wheel undercarriage that automatically follows the truck in turning. The device enables truck drivers to wriggle through traffic with relative ease. The front wheels swing independently, following the tracks of the truck. Pull is exerted on the rear set of wheels, which "follow the leader" in turning. Thus the load is distributed evenly over the unit, yet each set of wheels turns individually to increase maneuverability. Trucks equipped with the unit can turn a right angle from one 15-foot street into another of the same size without any of the tires scuffing the curb. Each set of wheels, suspended independently, absorbs bumps, an advantage in transporting fragile items. The manufacturer claims the undercarriage improves tire mileage.



Multipurpose Lamp Tilts on a Swivel

Versatility is the keynote of an all-metal lamp that can stand or be hung and is useful as a spotlight, floodlight or for therapeutic purposes. It is also adjustable, tilting and making complete turns on a swivel joint. The lamp takes 150 or 300-watt bulbs or infrared bulbs. Since a beam of light can be cast in any direction and the lamp is easy to install, it can be used to illuminate lawns, tennis courts and gardens, for store displays, photographic lighting, in machine shops and garages.



Racers watch the flag as they cross the starting line. Inside the long tube below the starter is an electric eye for timing the race. Below, an aircraft-type rudder works with the water rudder in controlling the boat

A MERICA'S race boat drivers expect to smash every record on the books.

They have an excellent chance to succeed, for numerous improvements in hulls and motors that were developed just before or during the war now are being used. Already many drivers are being clocked at speeds that would have seemed fantastic a few years ago.

Ten years ago, for example, the world speed record in the inboard 135-cubic-inch class was 53 miles per hour. That was fast time, considering that the 135s are small boats of limited horsepower.

But last November Tommy Hill of Oakland topped that speed by 27 miles per hour. His 14-foot boat averaged 80.178 miles per hour back and forth over a measured mile on the Salton Sea, California. He did it with a Ford V-8 "60" engine, hopped up to about 120 horsepower, in a 243-pound hull designed and built on the new three-point suspension principle.

A three-point boat is unlike any other craft you've seen. It has wide and deep winglike sponsons that flare back from its



BUGS



The radical hull of this hydroplane was designed to lift boat almost free of water. The boat below broke record with speed of 77 plus m.p.h.

bow. When the boat gets under way it rides on its stern and the two sponsons. Air is admitted under the forward end of the hull. At extremely high speeds the sponsons themselves begin to lift from the water and the boat takes on a slight side-to-side teetering motion as first one sponson and then the other touches the surface.

Three-point suspension had its beginning a number of years ago, but the war delayed full development of the principle by amateur racers. The design is covered by patents held by Ventnor Boat Works, builders of racing hulls and pleasure speed boats, but individual drivers have made use of the principle without infringement in building boats for their own use. Practically all inboard and outboard racing hydroplanes being built today are three-point suspension craft.

Another improvement in design is the cambering of the deck





Between races mechanics tune up V-8 "60" engine of 135-cubic-inch class boat



graphite; a plywood bottom is as slick as glass. Frames and other strengthening members also are cut from plywood and are as strong as the heavier beams formerly used.

New propellers that will stand up under the terrific punishment they receive in a race will be an important postwar development. Bronze blades are satisfactory at slow speeds but they tend to straighten out at the high rotational speeds being attained today.

A driver may wonder why his speed falls off shortly after the start of a race. Later he discovers that his propeller blades were pulled as much as two inches out of pitch when he opened his throttle and started winding up above 6000 r.p.m. New shapes and harder metals have been tried but most of them proved to be too brittle. One driver lost three

Left, the extreme lines of this three-point boat show how water resistance is reduced. Below, a timer connected with an electric eye shows the speed of each boat to 1/1000 second

to provide an airfoil type of lifting surface. Such a refinement was unimportant in the slower boats of the past but there is good evidence that at present speeds an airfoiled deck furnishes some lift. It has the effect of lightening the boat, thus reducing the amount of weight that the propeller must push through the water.

Some drivers are experimenting with air rudders in conjunction with underwater rudders. This combination provides positive control under all circumstances, since underwater rudders alone aren't always instantly effective in choppy water or when the stern rises momentarily into the air.

New phenolic-bonded plywoods that were developed during the war also are helping to produce more speed. They are lighter and stronger than the woods that were available previously. Plywood can be shaped to the exact lines desired without the seams and slight inequalities of a planked hull. With a coat of lacquer and a coat of racing wax or



blades in one day of racing, the last one smashing through his hull as if it were made of tissue paper. Now several propeller manufacturers have announced that they are testing new alloys expected to stand up without flying apart or pulling out of shape.

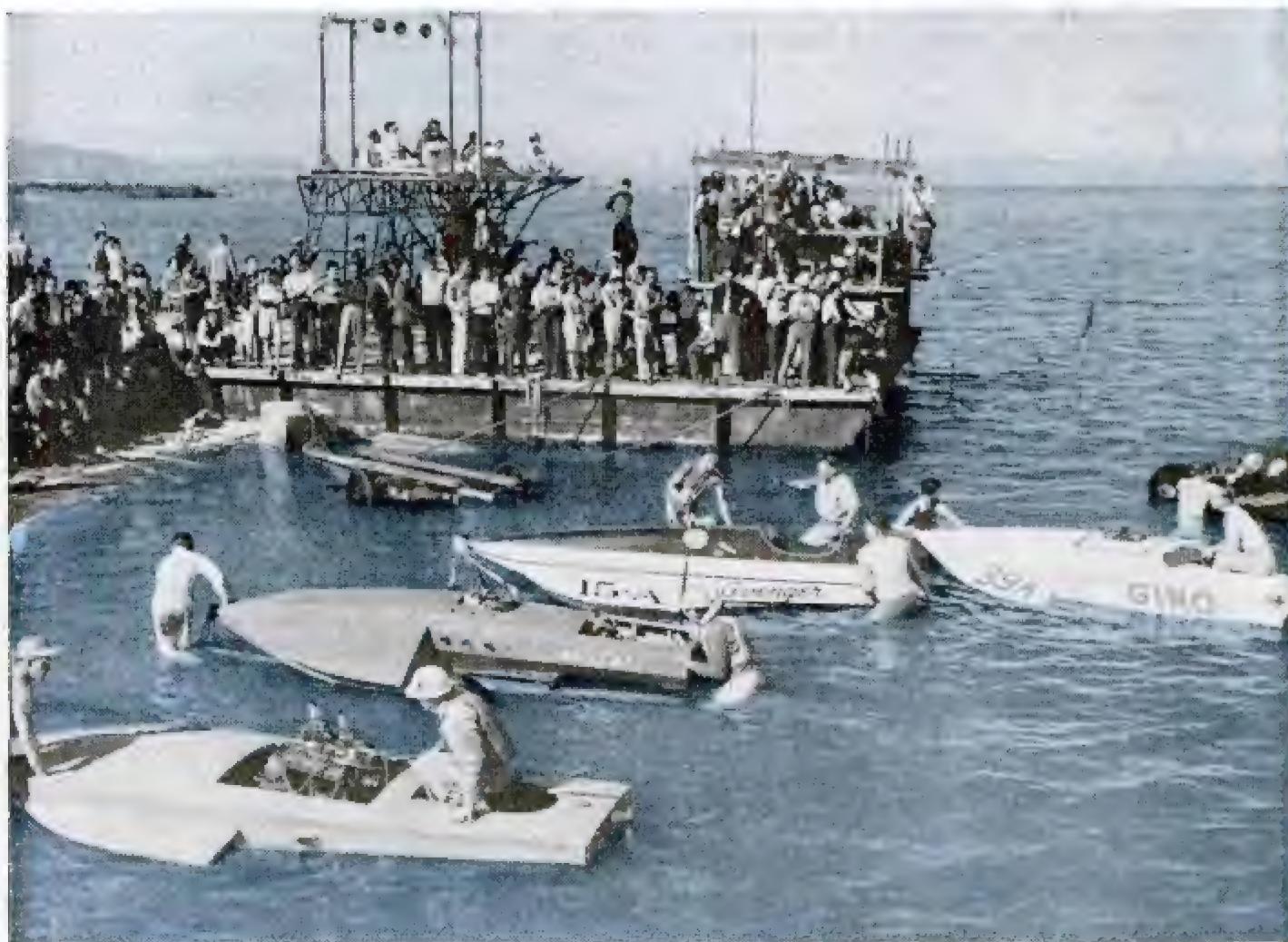
All classes of racing boats, both inboard and outboard, are classified according to the weight or dimensions of the hull, the cubic-inch displacement of the motor and other restrictions. These specifications provide a relatively even basis for all contestants and yet leave plenty of leeway for boat owners and their helpers to work out their own ideas.

Rebuilding a stock engine so that it winds up to a much faster r.p.m. is part of the secret of speed. The popular 135-cubic-inch displacement class, for example, is powered almost exclusively by V-8s that have a factory rating of 60 horsepower, yet these engines are rebuilt to deliver as much as twice that power.

Eddie Meyer, one engine expert who used to race automobiles and who now finds racing on water much more exciting, uses the stock block, crankshaft, connecting rods, wrist pins, valves and valve springs in his



Driver operates the fuel control with his left hand. In the event of spill or collision, the control shuts off automatically. Below, drivers get their boats ready for the next race





Three-point hydroplane teeters between bow sponsons on either side as speed lifts the craft from the water

135-cubic-inch racing motor, but most of the other parts are built especially for racing. Special lightweight pistons and all other moving parts including the eight-pound flywheel are dynamically balanced. A special camshaft provides faster valve action. A 10.5:1 compression ratio head is used, with two carburetors in special manifolding. Intake and exhaust areas are polished for smoother gas flow. Water for cooling is taken in through a small orifice in one sponson and is circulated across the bottom of the crankcase to cool the oil before it passes through the engine block.

Engine instruments consist of tachometer, oil temperature gauge, two heat indicators, fuel pump pressure gauge and water speedometer. The instruments are on rubber mounts that prevent vibration from affecting the readings.

Reworked like this, an engine can be wound up as high as 7000 r.p.m. Direct drive is used to turn the propeller at the same speed through a solid $\frac{3}{4}$ or $\frac{7}{8}$ -inch shaft eight or nine feet long. The $\frac{3}{4}$ -inch shafts sometimes snap under the heavy loads, so a number of drivers have gone

over to the larger size. Distributors, similarly, are not always efficient at high speed and are being replaced by magnetos.

Getting the most out of the motor is not the whole secret of speed, of course. The angle at which the sponsons ride in the water, the propeller's angle of attack and the way the boat is balanced all play a part. The first competitive race boats depended on brute horsepower alone for their speeds, before it was learned that hull and engine efficiency both contribute to speed. Hull efficiency went up when the amount of drag was reduced. The one-step hydroplanes were invented in an effort to reduce drag. The idea was successful and in turn led to the "shingle bottom" multiple-step hydroplanes. The next and possibly final basic improvement in hull design is the present three-point suspension in which practically all of the hull rides in the air. The amount of wetted surface at high speed approaches the irreducible minimum. Lifting the whole hull out of water and leaving only the propeller and rudder submerged might be possible if controllable air vanes were used,

(Continued to page 244)

This three-point boat climbs into the air with only stern touching the surface as it streaks toward finish line



Gripper Jaws Take 8000-Pound Bite to Lift Steel Barrels



Steel plate or heavily loaded steel barrels are picked up with ease with a cam lever mechanism that is attached by a chain to an industrial lifting truck or crane. Although they have no teeth, the $\frac{3}{4}$ -inch jaws of the gripper hold tightly; in fact, the grip becomes tighter as the load is increased. Consisting of two stamped steel alloy parts and a heavy chain, the lifting device is capable of picking up a four-ton load. The jaws of the gripper release immediately when the load is set down.

19-Story Drop Test

Scientists found a better way to make high-octane gasoline by dropping an oil-cracking catalyst from the top of a 19-story elevator shaft. Chemists of the Standard Oil Company of Indiana tried the experiment to find out if a long drop would cause particles of a new catalyst, used in cracking gasoline, to form in spherical instead of doughnut shapes. They sprayed the mixture into the air at the top of the elevator shaft and collected the particles at the bottom. They were spherical. So now the company may build a 200-foot tower to drop the catalyst.

Sturdy "Screw-On" Aluminum Legs Serve for Benches and Stands

Aluminum legs $27\frac{1}{4}$ inches high are now available for building power tool stands, work benches or garden tables. Made of airplane tempered stock having approximately the same structural strength as steel, the legs are equipped with castings at top and bottom. The top castings have holes countersunk on the underside for screws to attach to the work surface. The bottom castings contain holes for screws or bolts to secure the stand or bench to the floor. Midway between the top and bottom of the legs are holes for shelf brackets.

X-Ray Spots Flaw in Shell

Why an armor-piercing shell failed to penetrate the target was revealed when its flight was examined by a Westinghouse high-speed X-ray device. The projectile's cap, designed to pierce case-hardened armor plate, was found to rip free from the bullet on leaving the barrel. The bullet later overtook and destroyed the cap and went on to a futile meeting with the target.



Steel Support With Built-in Jack Levels Sagging Floors



Sagging floors are leveled and their accompanying squeaks eliminated with a steel post which has a built-in jack. Supporting up to 20,000 pounds, the post can be adjusted gradually each week to bring the floors slowly back to level. The post, weighing 28 pounds, is of telescopic construction and can be adjusted to fit basements with five-foot seven-inch to eight-foot four-inch ceilings. In addition, the jack part of the post is adjustable.

"Bent" Light Illuminates Sign

Easy-to-change letters employ refracted light as illumination for an advertising display sign. Fluorescent light tubes are concealed in a metal cabinet, slotted at the



front. The slots, covered with plastic flaps when not in use, hold the curved ends of plastic inserts which are etched or sandblasted with letters, figures and designs. These curved inserts "bend" the light from inside the cabinet so that it is reflected on the etched letters. The sign gives the effect of brilliant illumination, although no light is seen directly. A glass at the top may be etched with any trademark or design to be displayed permanently. The edge of the glass picks up the illumination for this part.

Air-Cooled 'Lighthouse in Tube' Triples Glow of Lamp

Three times the light of a conventional 1000-watt incandescent bulb is produced with a Westinghouse mercury vapor lamp of the same wattage. The air-cooled "lighthouse in a tube" is designed for sports arenas and high-ceiling factories. The light source is an arc stream the diameter of a cigarette and twice as long. It is enclosed in a quartz tube enclosed, in turn, by a hard glass exterior tube. Overall, the lamp is 14 inches long and less than four inches in diameter. Boosting the mercury vapor pres-



sure inside the tube four times beyond pressure levels used previously has resulted in tripling the light output. Efficiency, on the basis of light produced for electricity consumed, has been increased as much as 50 percent, according to the designers. Formerly such lamps were cooled by forced air or water. The new bulb, operating at 1100 to 1300 degrees Fahrenheit, is cooled by the surrounding air.

Bottle Opener and Recapper Combined Into One Unit



Bottle opener and recapper are combined in a handy device that fits into a person's palm. The opener removes caps without bending or mutilating them, and the recapper puts them back on nearly as airtight as when the beverage originally was bottled. Models are available in gold plated, silver plated and nickel plated finishes.

Pocket Tester for Booby Traps Checks Electrical Circuit

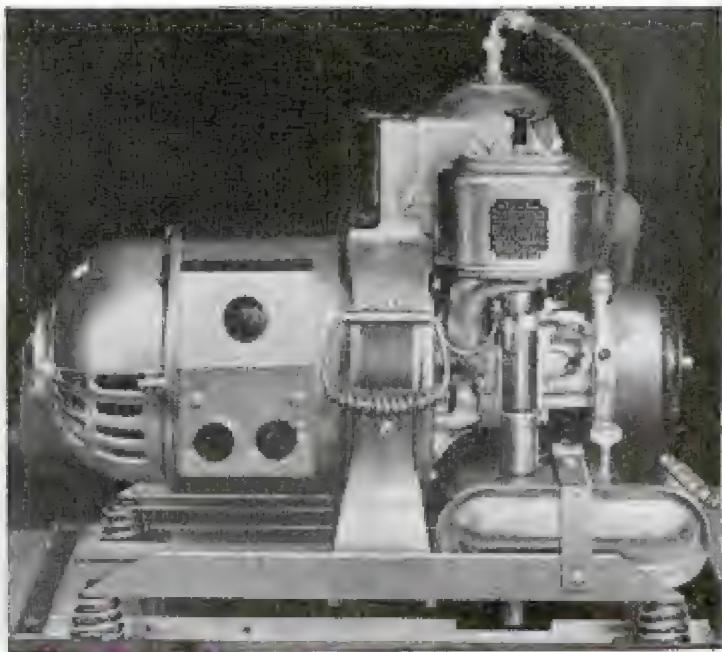


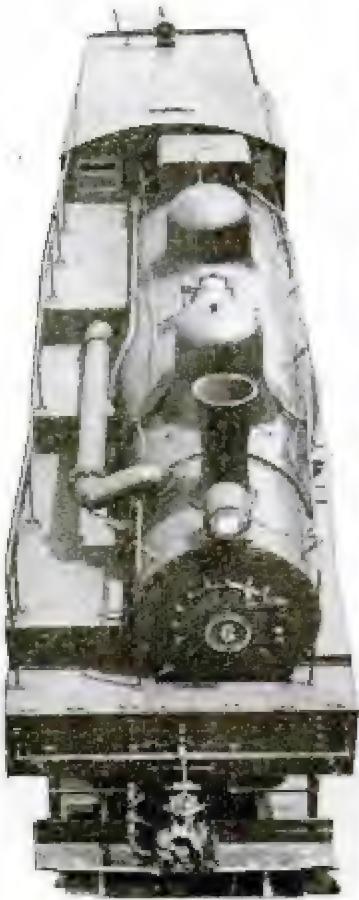
No larger than a cake of laundry soap, a compact testing device enabled American explosive engineers to be certain that every booby trap and land mine would explode after being planted. A miniature ohmmeter checked the electrical circuit without exploding the mine. The unit is self-contained and is adaptable to peacetime use.

Portable Power-Light Unit for Emergencies Is Adapted From PT Boat

Portable all-weather generators developed to charge aircraft batteries and supply auxiliary power for PT boats now are being used to provide emergency light and power during disasters, for construction work and for rush farm jobs. Powered by a gasoline

engine, one unit weighs 105 pounds, and generates 2000 watts of direct current at 120 volts. The engine has a $\frac{1}{4}$ -inch Hycar synthetic rubber seal around the needle valve in the carburetor which makes it possible to use any grade of gasoline.





Quick starts with heavy loads and increased power on steep grades are the forte of

the lopsided Shay locomotive, one of the latest of this type having been built by the Lima Locomotive Works for the Western Maryland Railroad. The boiler is $14\frac{3}{4}$ inches off center to the left to counterbalance three cylinders and other machinery grouped on the right. The three cylinders are mounted vertically and drive a crankshaft connected through couplings and sleeves with line shafts extending forward to the front truck

Lopsided Locomotive Has Off-Center Boiler

and backward to the two rear trucks. The line shafts have pinions that engage gears attached to the wheels, all of which are driving wheels. Ordinary steam locomotives with two cylinders have four impulses from the pistons for every revolution of the drivers. The off-center locomotive with its three cylinders provides 12 to 18 impulses for every revolution, depending upon the gear ratio, and its weight is distributed evenly over three four-wheel trucks. It was designed for short hauls and switching service.



One-Finger Reel Aids Maimed Vet

Loss of all fingers except one on his right hand fails to prevent a soldier-sportsman from operating a fishing reel. A specially designed reel has two indented cups, mounted on ball bearings, which enable him to spin the reel. The cups prevent his finger from jumping off the disk and the ball bearings assure easy operation and eliminate the possibility of finger burns that might be caused in spinning the metal disk.

SALT WATER *Butterflies*



HOME OF TREASURES



Snail shells, Tahiti jets and abalones from the Pacific ocean floor are transformed by craftsmen into mother-of-pearl costume jewelry. Cut in two by a water saw (top left), shells have their "bark" removed and are ground and polished (left). Delicate lines are added to ornamental butterflies (below) and wire frames are attached. Some are dyed in various colors.

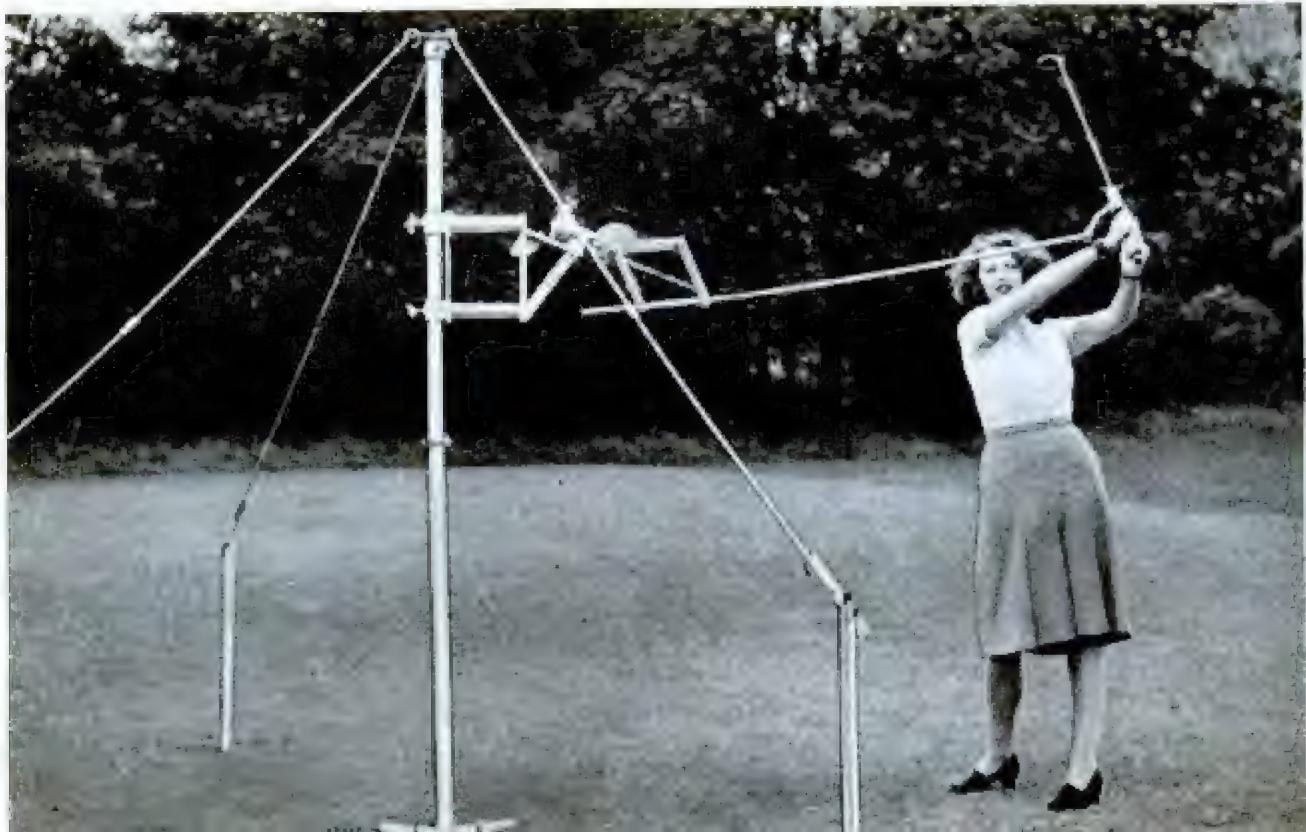


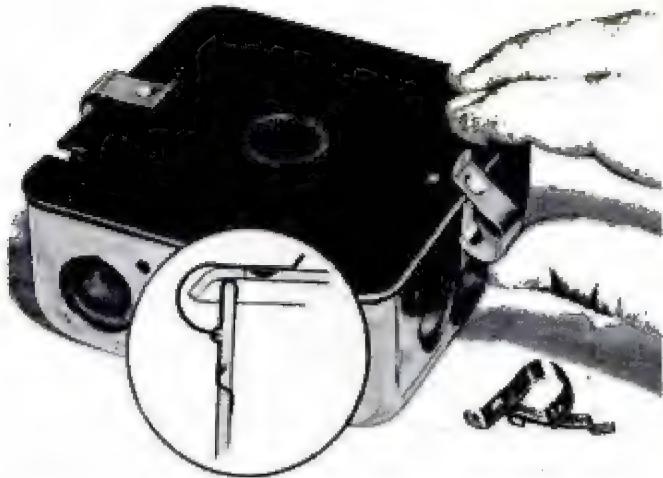


A mechanical golf pro helps golfers swing in the perfect arc necessary for accuracy and distance. R. F. Cottingham of Scunthorpe, Lincolnshire, England, designed the unit

The device can be set at any angle to suit the individual golfer's height, strength and movements. At top left, mechanical guidance of the putting stroke sends the golf ball in a straight line toward the cup

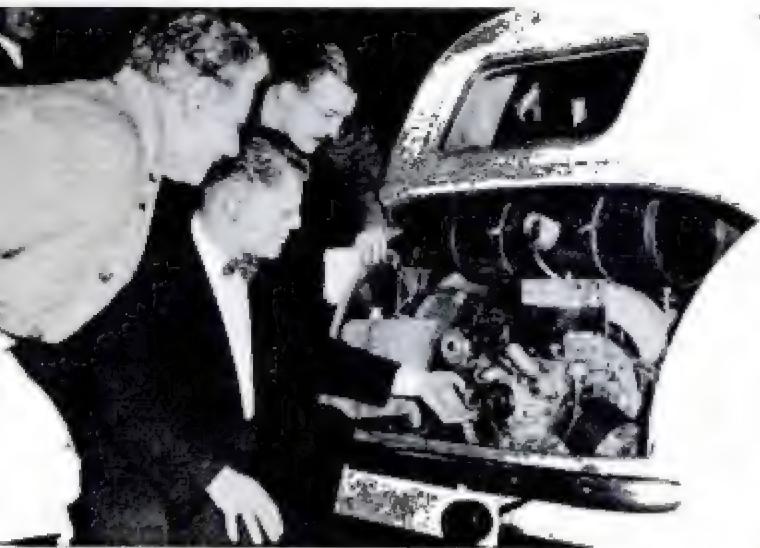
Another version of the mechanical pro guides the driver, top right. Improved distance results from a proper swing. The machine makes an improper swing impossible, center. A brake can be applied to impress the correct swing on a student as in the follow through, bottom photo





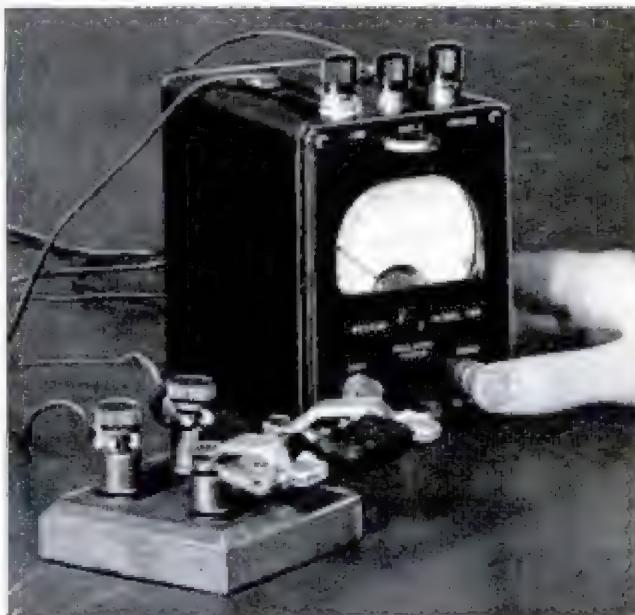
Box Tops Are Held Tightly by a steel clip fastener that eliminates the need for screws or nuts and requires no tools for attaching. The clip is snapped on by hand, with the lower part fitting into holes in the side of the box, and holds the cover securely. A slight push with the thumb detaches the clip and permits removal of the cover.

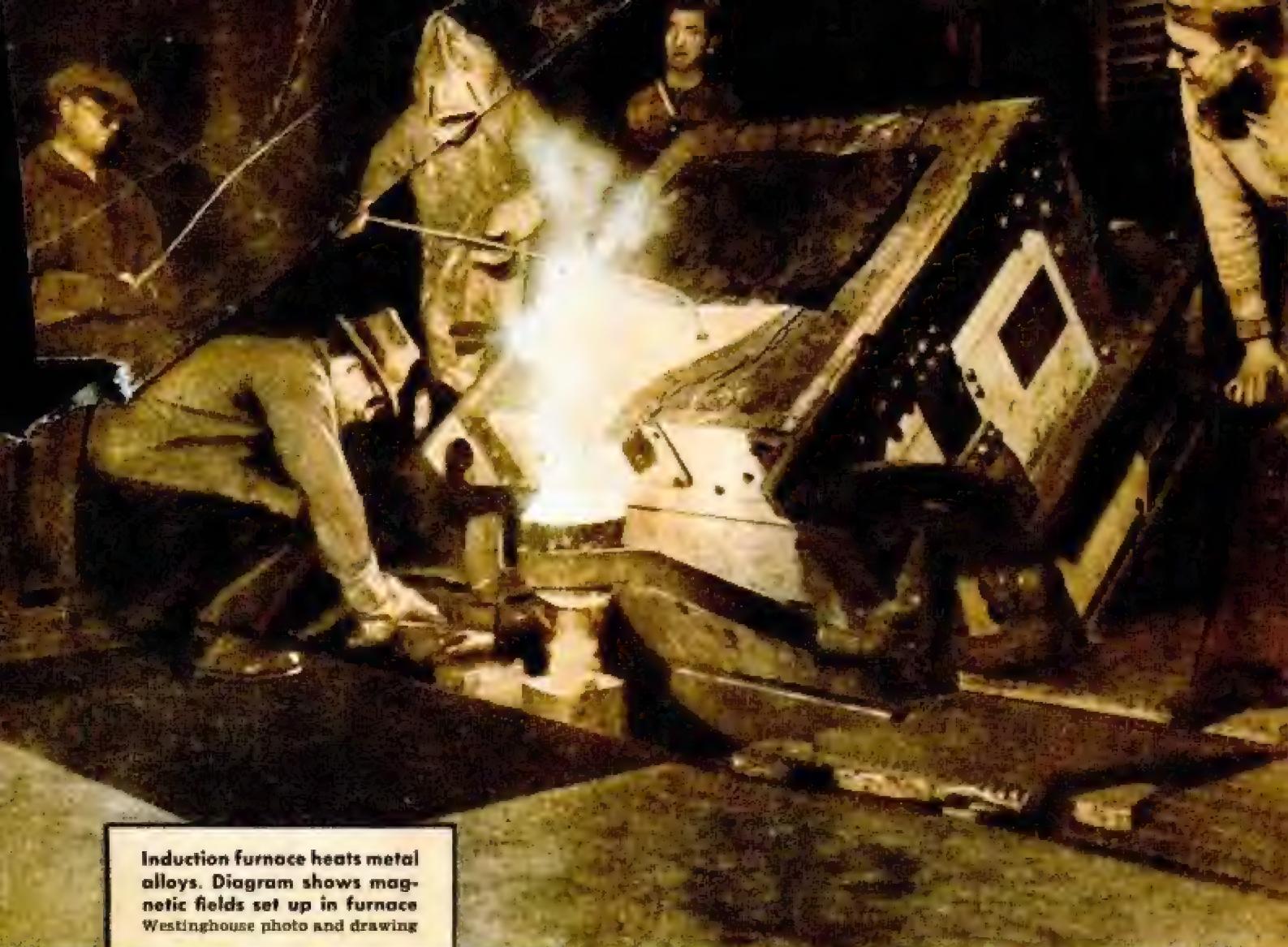
Britain's New Kendall Car, designed for low fuel consumption, has a three-cylinder engine mounted at the rear. The streamlined car will sell for approximately \$750.



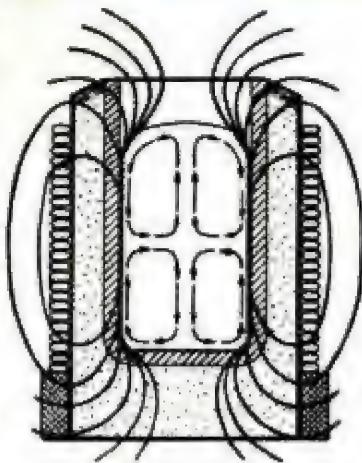
Synthetic Nonpetroleum Lubricant is reported to give all-weather starting ease, greater engine cleanliness, improved performance and freedom from wax. Called Prestone motor oil, it is one of a series of synthetic oils made from natural or other hydrocarbon gases. It will flow freely at a temperature as low as 30 degrees below zero Fahrenheit, where ordinary petroleum would freeze solid. The oil is more expensive to produce than petroleum lubricants and is being marketed on a limited basis.

Midget "Leakage" Tester, small and compact, operates on an electronic circuit and requires only one hand to operate. The unit tests insulation properties of plastic paints, varnishes or lacquers. It also shows leakage resistance caused by moisture absorption, insulation leakage in motors, machinery and cables, or it will test safety shoes, floor covers and other safety devices for electrical conductivity. To save battery and tube life, the unit has a "press to read" switch which operates only when in use.





Induction furnace heats metal alloys. Diagram shows magnetic fields set up in furnace
Westinghouse photo and drawing



INDUSTRY *Cooks with Electrons*



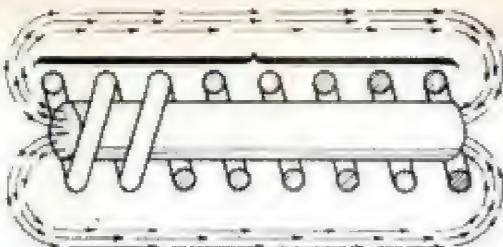
By Thomas E. Stimson, Jr.

Once upon a time radio meant a tune in the parlor or a news broadcast. Now radio frequencies are industry's cookstoves, melting metals and molding plastics, bonding plywood and killing bugs

Cooking hot dogs with radio waves, a popular act at electronics shows, is a spectacular introduction to new and important uses for high-frequency electricity.

Today radio waves are defrosting foods in a few minutes, "welding" plywoods and veneers in minutes instead of hours and vulcanizing rubber tires in a fraction of the usual time.

High-frequency electricity in the radio and radar bands is used to sew plastic fabrics and synthetic fabrics together without the use of thread. It cures the glue in ladies' shoes and doesn't scorch the leather. It creates an artificial fever in



INDUCTION HEATING: Agricultural mower blades are hardened electronically. The sketch shows work in the magnetic field that is created by current in an induction coil.

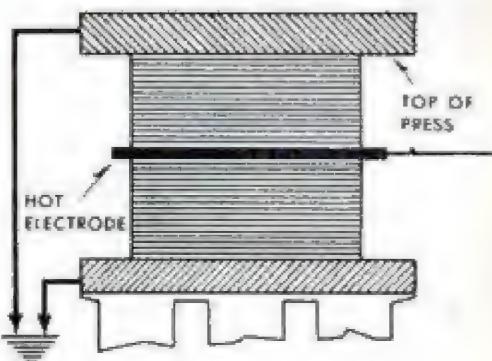
quency electricity is applied, the alternating force of the current causes a molecular agitation in the material. This agitation develops friction and this in turn creates heat in the same way that rubbing your

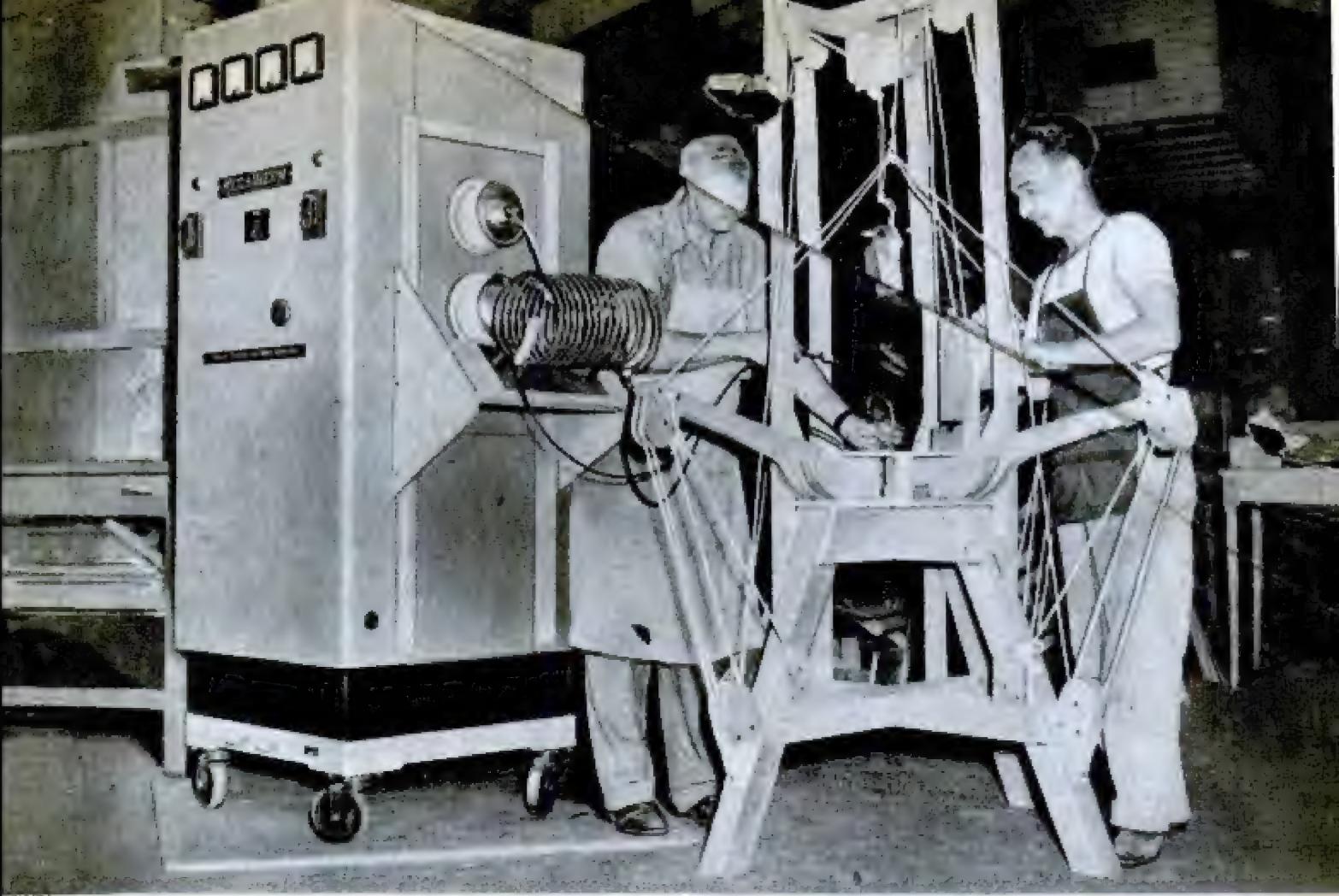
hands together warms them. The energy is absorbed by the material in relation to its conductivity. Hence a glue line in wood, or weevils in dry cereal, rapidly become hot while their surroundings remain cold. Within mechanical limits thickness doesn't matter. Plywood beams that are more than a foot thick consisting of 148 layers of birch veneer to which phenolic resin glue has been applied can be cured quickly with dielectric heat, permitting immediate use.

Electronic heating promises to revolutionize the rubber industry. Authorities say it is six times as fast as earlier methods and



DIELECTRIC HEATING: Plastic preforms are heated by placing them between two electrodes carrying high-frequency current as shown in the sketch. Westinghouse photos and drawings



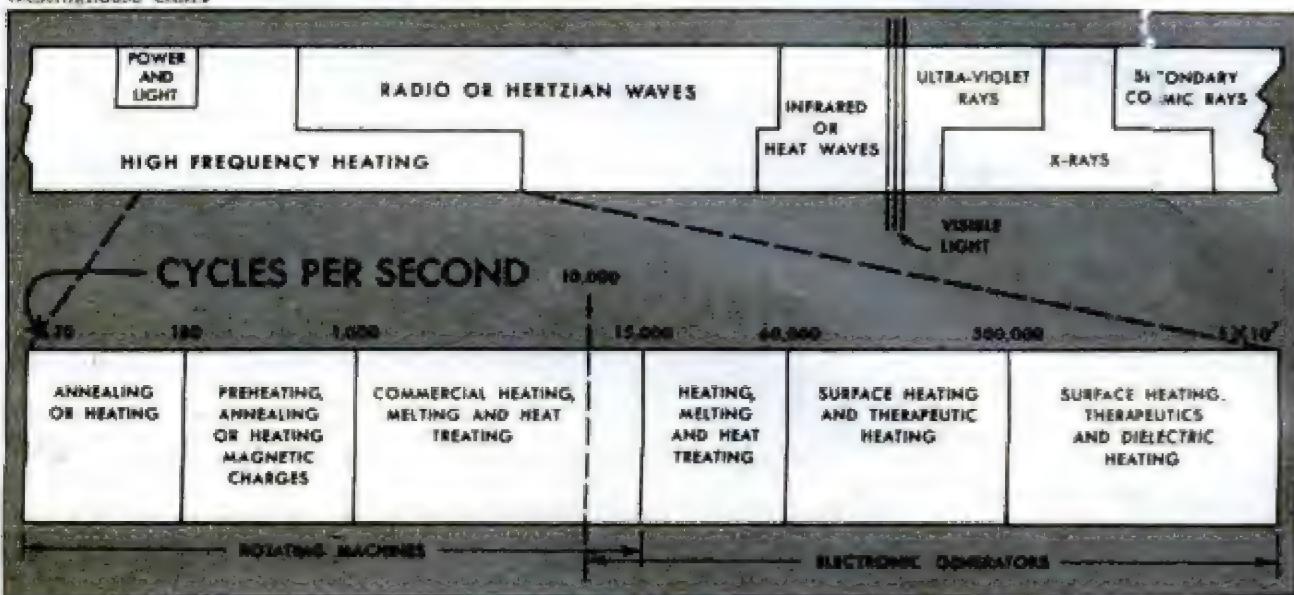


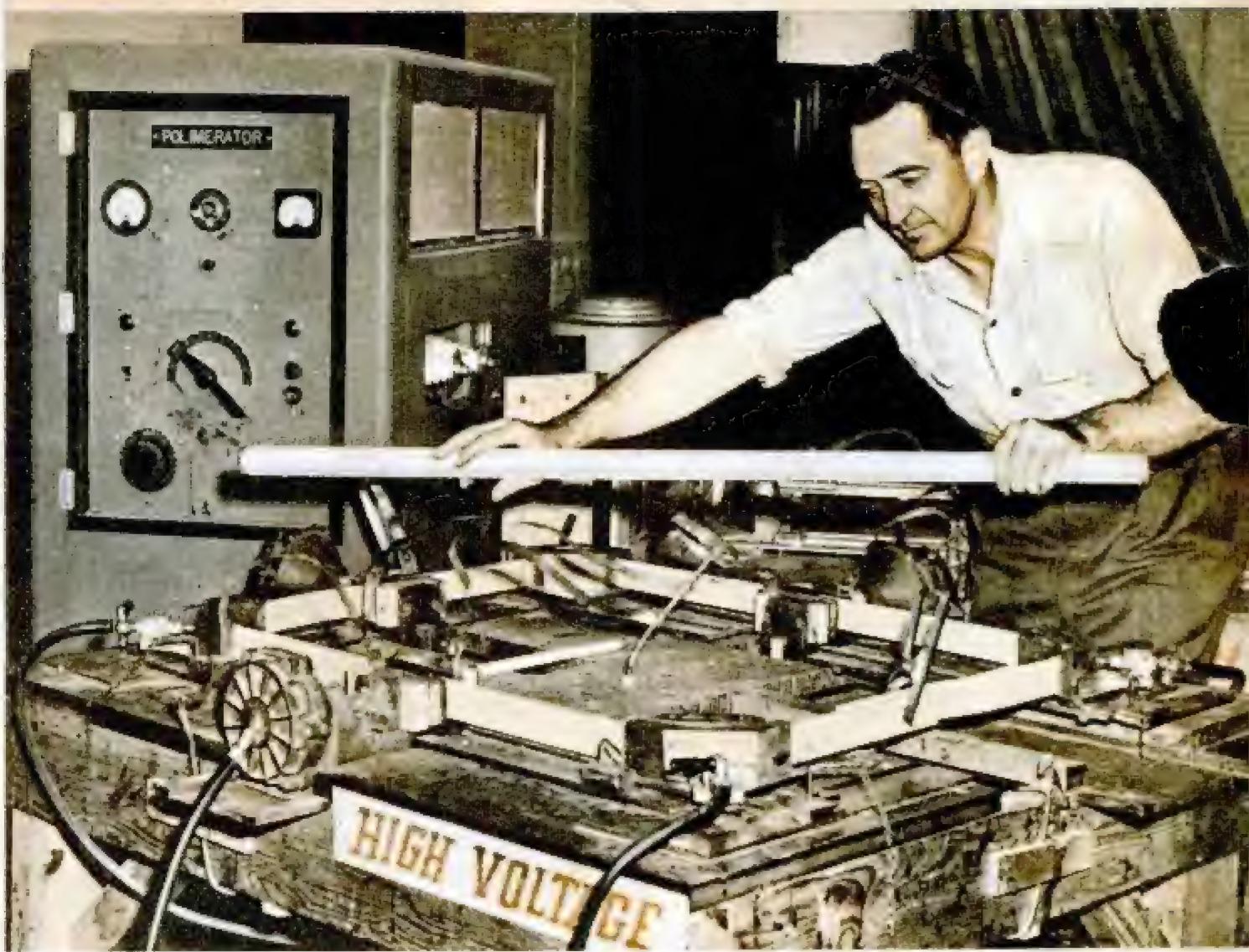
This complicated machine tests the strength of wood reinforcing angles after they are bonded by radio heat. Right, a heat "gun" cures glue inside wooden furniture.

shafts for aircraft, tank and Diesel engines now are hardened inductively. It takes about two minutes to place the special inductive collars around a 13-bearing crankshaft, heat the bearing surfaces red hot and quench them. Rocker arm shafts for aircraft engines are hardened similarly at the rate of 1000 per hour. Interiors of automobile hubs are hardened by inductive heat, and even the cutting edges of chisels receive a local heat treatment that doesn't affect the toughness of the rest of the



Diagram shows that part of the high-frequency radio wave spectrum that can be used for electronic heating Westinghouse chart





the human body for relieving pain and fighting infection.

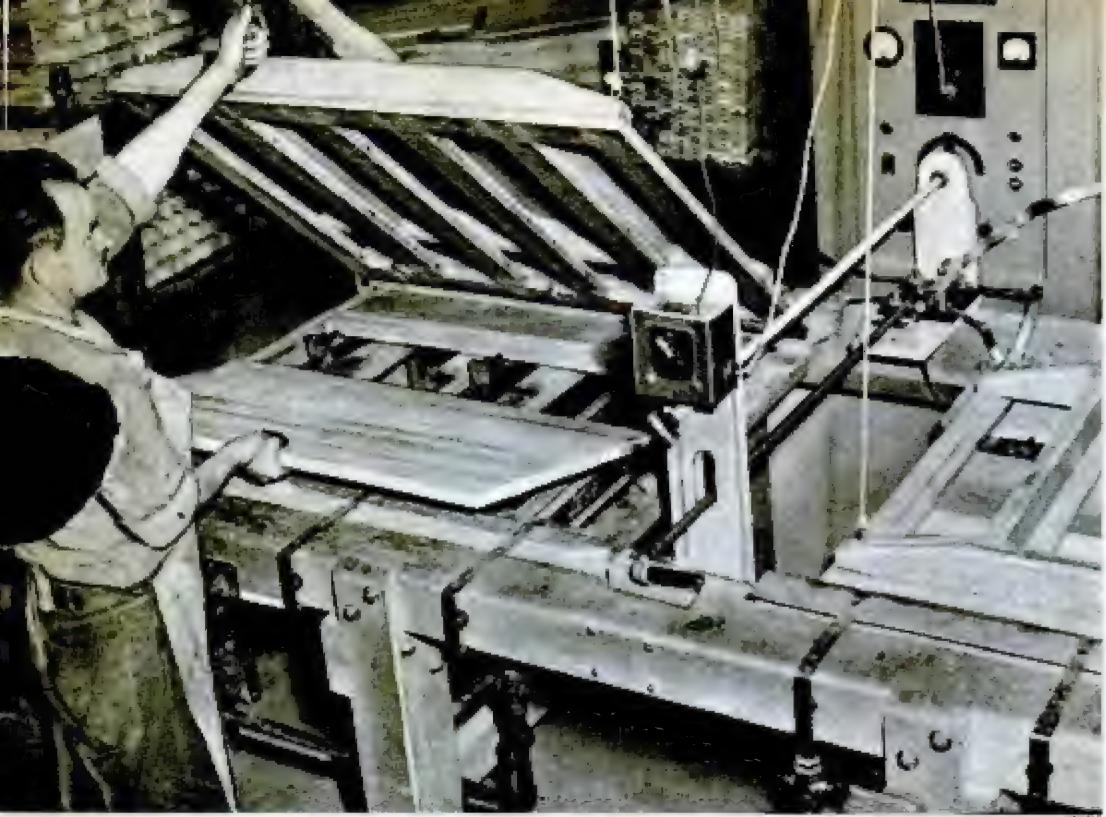
Radio heat hardens the bearing surfaces of crankshafts and puts a superhard finish on the cylinder walls of internal combustion engines. It solders metals faster than they can be soldered by hand. In a single operation alone, that of "flowing" electrically deposited tin plate to smooth and brighten its surface, more than $2\frac{1}{2}$ times the power of all the radio broadcasting stations in the United States is used.

The 92 miles of wood reinforcing angles that were used in the construction of the 225-ton Hughes flying boat were manufactured by means of radio heat. The sturdy laminated beams used in the hull and the subassemblies of the boat were joined with the same high-frequency heat.

Soon radio may be used in the construction of homes by immediately curing the glues that are replacing nails for some purposes. It promises to kiln-dry lumber in less than an hour. Green lumber is put into a kiln to which a high-frequency current is applied for a short time; this draws the lumber's moisture content down to any desired amount without checking or

Fluorescent tube glows when held near wood-bonding machine. Below, cooking muffins on a "radio" stove





Glue in wood table top is cured in two minutes in a high-frequency heating jig. Below, these curved plywood beams were bonded by radio heat for use in building the giant Hughes flying boat

gory. It's possible in theory but would be too expensive at present.

In the past, heat usually has been applied by conductive methods, that is, transferring heat by contact. In some applications conductive methods do more harm than good. Wooden furniture, for example, would have its outer surfaces burned if enough heat were applied to dry out its interior glues in a hurry. To avoid this the furniture must be set aside for days to allow the glue to dry. If heat is applied by ordinary methods to the teeth of a gear wheel to harden them, the whole wheel absorbs the heat and becomes brittle.

High-frequency heat, on the other hand, is applied just where it is needed—internally in the case of the furniture, externally in the case of the gear wheel. The surfaces of the gear teeth become red hot in a couple of seconds; the metal then is quenched before the heat affects the interior.

Heat is "crowded" onto the surface of a metallic conductor such as the gear wheel by the induction method—placing the wheel in the magnetic field of a high-frequency induction coil. Heat is created inside a nonconducting substance such as wood by the dielectric method—placing the material between the plates of a condenser to which high-frequency electricity is applied, causing molecular agitation.

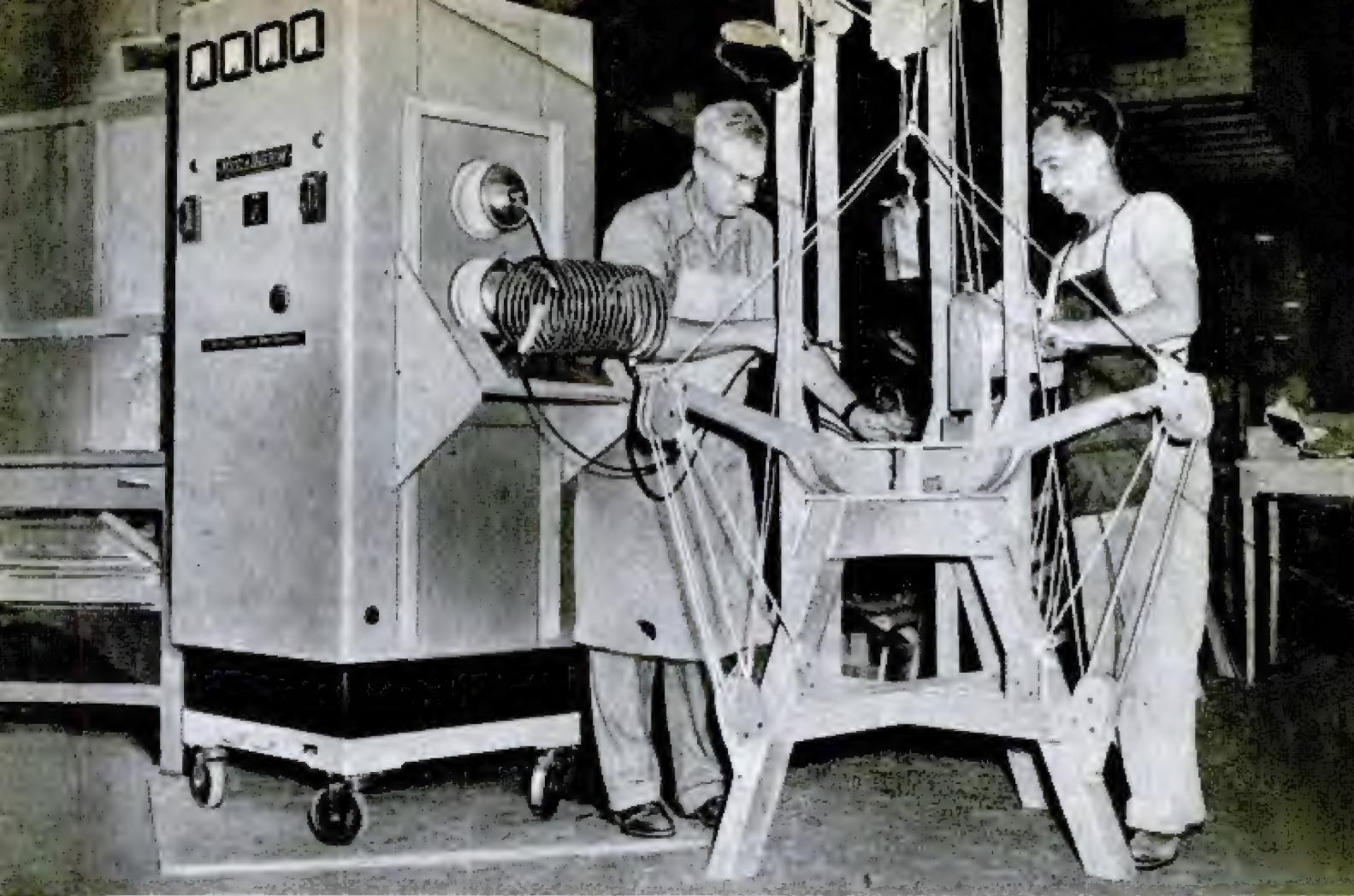
Induction heating has become a standard industrial process. It melts tool steels and other special alloys. It is used in annealing and heat-treating processes. A low-frequency current of about 1000 cycles is the most efficient for such work. At higher frequencies the heating effect is shallow and at ultra-high frequencies the direct heating action affects the skin of the material only, without heating the interior.

Electrical engineers put this phenomenon to work in a dozen different ways. The bearing surfaces of practically all crank-

warping. Electronic heat may be used for the curing of alfalfa and other hays that are subject to spontaneous combustion during the drying process. It has been used to sterilize cereal foods and other packaged products. It shells cocoa beans and roasts both cocoa and coffee beans.

An electronic stove for the housewife has been proposed, but engineers are not yet ready to concede that it would be practical. The cooking of nonhomogeneous foods such as meat that contains fat and bone still requires further investigation. Heating your home electronically is in the same cate-





This complicated machine tests the strength of wood reinforcing angles after they are bonded by radio heat. Right, a heat "gun" cures glue inside wooden furniture

shafts for aircraft, tank and Diesel engines now are hardened inductively. It takes about two minutes to place the special inductive collars around a 13-bearing crankshaft, heat the bearing surfaces red hot and quench them. Rocker arm shafts for aircraft engines are hardened similarly at the rate of 1000 per hour. Interiors of automobile hubs are hardened by inductive heat, and even the cutting edges of chisels receive a local heat treatment that doesn't affect the toughness of the rest of the

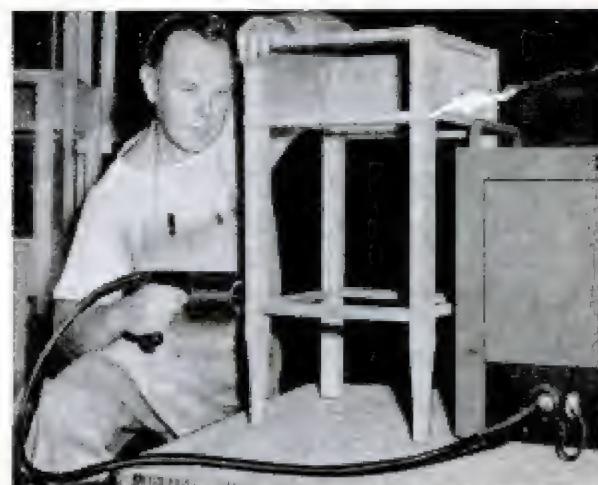
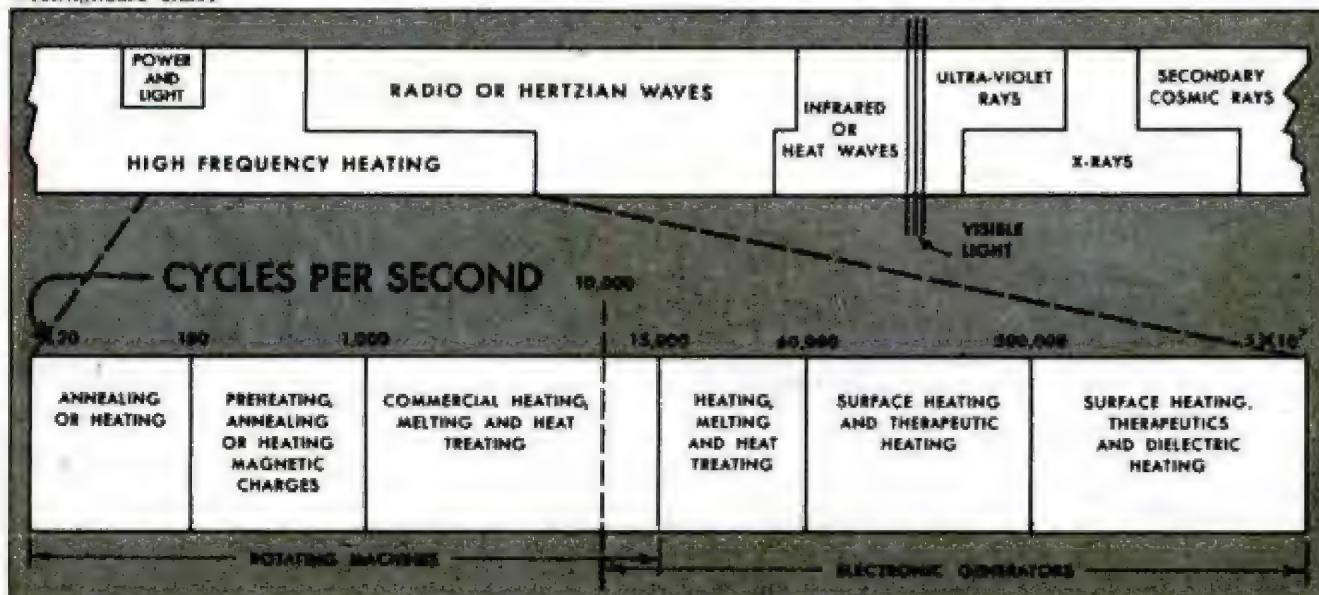
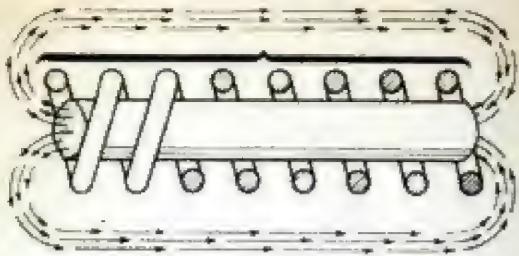


Diagram shows that part of the high-frequency radio wave spectrum that can be used for electronic heating
Westinghouse chart





INDUCTION HEATING: Agricultural mower blades are hardened electronically. The sketch shows work in the magnetic field that is created by current in an induction coil

metal. The solder that secures the spout to your can of household lubricating oil was probably flowed into place by inductive heat. Westinghouse Electric Corporation, one of the leaders in the inductive heating field, has developed circuits for induction brazing that now are widely used.

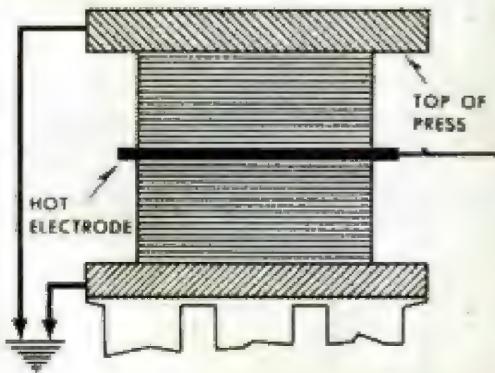
Dielectric heating works in a direction just opposite that of induction heating. It heats from the inside out when applied to materials that are nonconductors or poor conductors of electricity. When a dielectric material such as wood is sandwiched between two electrodes to which high-fre-

quency electricity is applied, the alternating force of the current causes a molecular agitation in the material. This agitation develops friction and this in turn creates heat in the same way that rubbing your hands together warms them. The energy is absorbed by the material in relation to its conductivity. Hence a glue line in wood, or weevils in dry cereal, rapidly become hot while their surroundings remain cold. Within mechanical limits thickness doesn't matter. Plywood beams that are more than a foot thick consisting of 148 layers of birch veneer to which phenolic resin glue has been applied can be cured quickly with dielectric heat, permitting immediate use.

Electronic heating promises to revolutionize the rubber industry. Authorities say it is six times as fast as earlier methods and



DIELECTRIC HEATING: Plastic preforms are heated by placing them between two electrodes carrying high-frequency current as shown in the sketch. Westinghouse photos and drawings



turns out better products. It is applicable to the manufacture of either natural or synthetic rubber.

One of the important factors in making rubber is the even heating of the materials to prevent flaws. Electronic heating promises to be ideal for this work. In addition, it bonds the sulphur and rubber molecules more completely by agitating them. At present, heating by radio in the rubber industry is confined to the production of cushions, upholstery, mattresses and other sponge rubber articles. But experiments have been conducted with electronic curing and drying of automobile and airplane tires, elastic thread, tank track treads, rubber wheels for industrial trucks and brake blocks of resin and asbestos.

Electronic heating makes possible a further saving of time in drying the molded rubber. Twelve hours were required to dry molded rubber seat cushions in a steam oven. Today they are dried thoroughly by a one-minute electronic treatment followed by one hour in a drying tunnel.

In the plastics industry dielectric heat is widely used for preheating plastic material before it goes into the molds. A large quantity of the material can be heated throughout without overheating the exterior. Dielectric heat is also a boon to cabinet-makers who now can avoid using nails and other fastenings that require concealment. It promises to put furniture manufacture on a production line basis by eliminating drying time delays. Its possible use



This plywood shape for an article of furniture was molded in only two minutes by high-frequency heat. Below, engineer inspects machine that generates heat in dielectric substances by beaming waves of energy in the radio spectrum





A technician tests the circuits of a large electronic tube that generates high-frequency waves. The waves are approximately the same length as those used by short-wave broadcasting stations

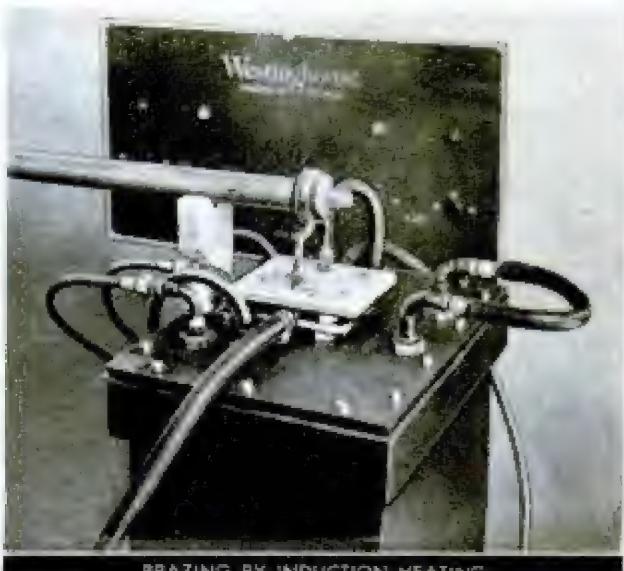
is being studied in the fields of dehydration, the drying of oils and in creating chemical reactions requiring "inside" heat.

Merit Shortwave Diathermy Company of Los Angeles, a manufacturer of artificial fever machines for medical use as well as industrial dielectric units, has developed

The induction heating process is applicable to materials that will conduct electricity. Below are shown some of the uses of this "broadcast" heat. The highest wave frequencies are required for heating only the surfaces



ANNEALING STEEL PINS



BRAZING BY INDUCTION HEATING



CAN SOLDERING

an electronic heat gun that dispenses with the two electrodes that are usually required for dielectric heating operations. The gun consists of one electrode at the end of a coaxial cable. It produces heat in a dielectric material when it is held against the material and the trigger pressed. Adapted for heat "tacking" and for curing glues in furniture manufacture and residential construction, the gun contains a small neon lamp that glows bright red as soon as the glue is set. Thin pieces of wood and glue are permanently bonded by the gun in a couple of seconds and thicker material "welded" in less than a minute.

Explosive rivets have been developed to facilitate riveting where only one side of the rivet can be reached. By applying heat to that side, a small explosive charge is set off that completes the riveting job instantly by spreading the "blind" end. Heating the heads of these rivets is now done quickly and simply by use of a radio-heat gun that induces electric currents in the rivets.

Electronic heating of high explosives is much more satisfactory than other heating methods. It is easier to control and heats such dangerous materials much more uniformly, an important safety factor.

One of the major advantages of dielectric heating is its speed. During the war airborne plywood rescue boats weighing over 1½ tons were developed to be dropped by parachute to flyers lost at sea. The total production time of each boat with original

methods of construction was six months. With an electronic generator, production time dropped to 26 days. And rejected work was reduced from 40 percent to 2 percent.

High-frequency electricity for either induction or dielectric heating is created by electronic generators of the vacuum tube type. The circuits are essentially those of short-wave radio transmitters. Frequencies are confined to bands that will not interfere with short-wave radio communication. Certain frequencies appear to be the most effective for heating certain materials although in a general way the greater the frequency the more rapid is the heating effect.

Radio heat is much more efficient than most conventional kinds of heat. An electronic generator normally is 50 to 75 percent efficient, the remainder of the power being disposed of as waste heat. An automobile engine is only about 30 to 35 percent efficient, an incandescent lamp less than 10 percent and a steam locomotive about 8 percent.

Because electronic heating devices have few moving parts they require little maintenance. Tubes often give a year or more of uninterrupted service. The equipment for radio heating does not produce vibrations which might have a serious effect on the material being treated.

High-frequency heating of either type is quite expensive. It's far cheaper, for example, to boil water by building a fire under the pot than it is to boil the water by using radio waves. High-frequency heating has little advantage in operations where temperatures are not critical. On the other

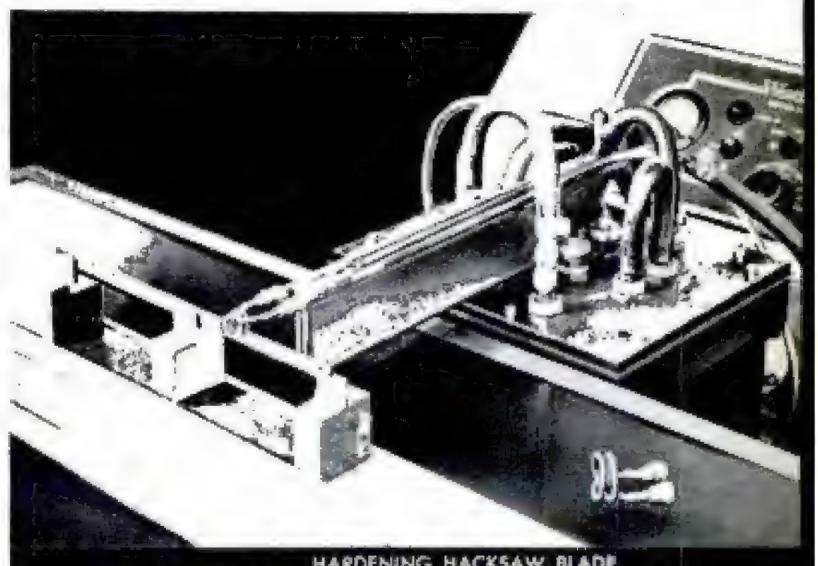
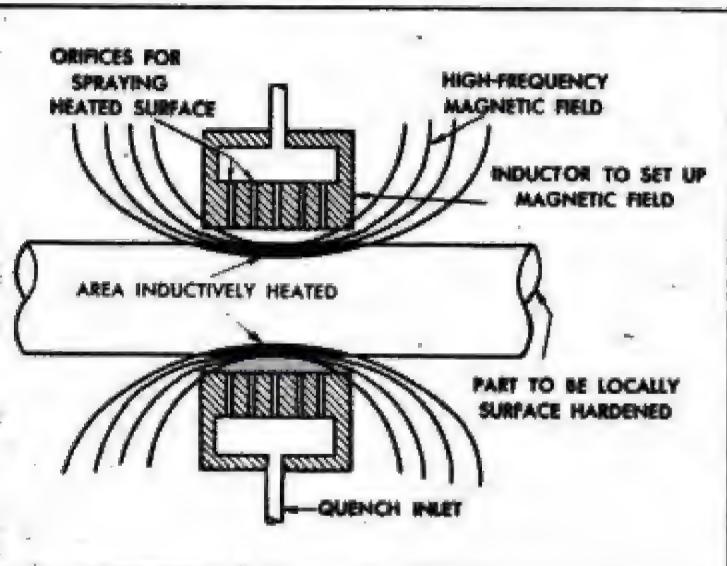
Sinus patient dons mask equipped with rubber-padded electrode to take treatment from radio fever machine

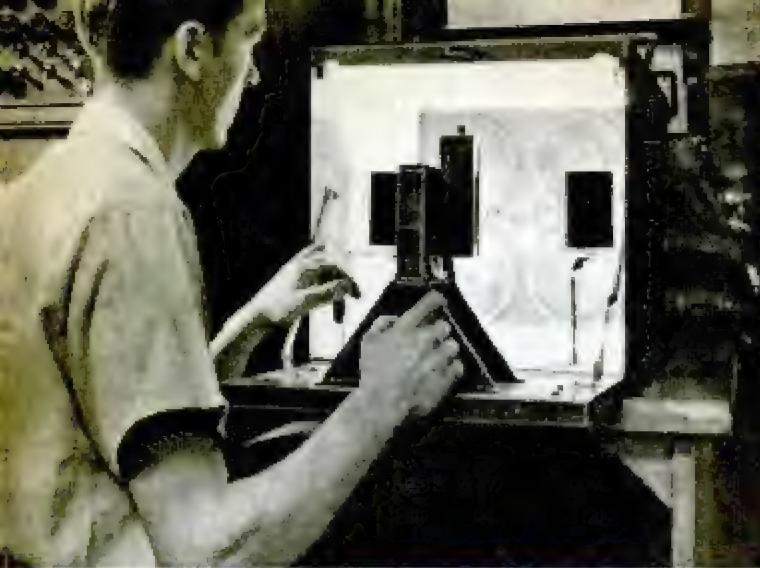


hand it often produces a result that is impossible with other heating methods, it increases the speed of a process, confines the heat to the desired area, and is clean and compact.

Not all of its possible applications have been investigated yet. Further uses are being developed. For this purpose Westinghouse Electric is opening three regional high-frequency heat laboratories where the practicability of heating various products electronically by beaming short waves to them is being studied.

A typical surface hardening block for induction heating is diagrammed below. It includes openings to cool the work quickly by quenching it after heating. At right, hacksaw blades are hardened by a similar block





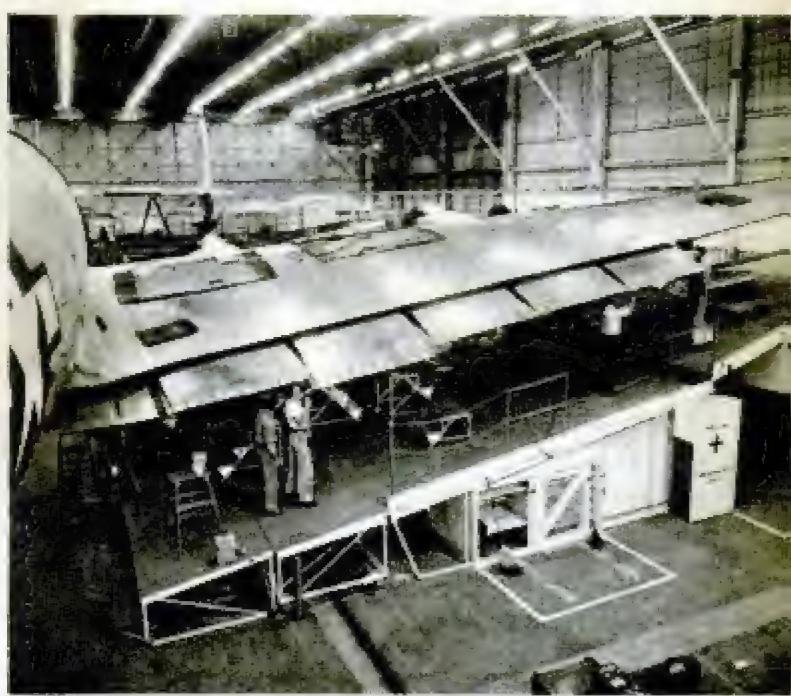
"TWO-EYED" MOVIE CAMERA made by Western Electric recorded results of tests on electrical gun directors. Using a 16-millimeter film, the camera takes 50 feet of movies and photographs dials and moving target



DIRECT-WRITING ELECTROCARDIOGRAPH records patient's heart action as it "listens," eliminating photographic procedure required with former machines. New instrument magnifies heart action about 14,000 times



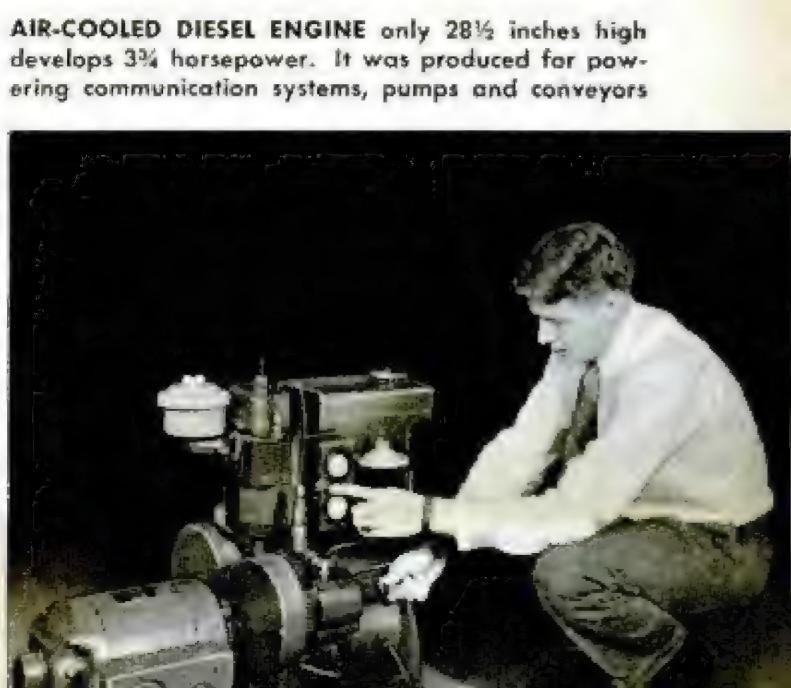
GAUGES for a thousand precision checking jobs are made up from instruments packed in case 20 inches long. They are used in conjunction with gauge blocks



INCLINED FLOORS provide workers with plenty of room to install ailerons, wing flaps and other subassemblies in the wings of giant Lockheed Constellations



PLUMBER'S "STETHOSCOPE" locates underground leaks in water pipes and leaks in steam pipes behind walls and under floors. Air chambers amplify sound





Information board held up in pits tells the driver the number of laps he has run—a scene at one of the last prewar races

They're Warming Up for the *SPEEDWAY*

HALF a dozen theories on how to win the Indianapolis race will be put to the test on Memorial Day.

Some drivers, burning straight high-octane gasoline, hope to finish the 500-mile classic without one stop at the pits. Others will use alcohol or alcohol-gasoline blends and will depend on flashier speeds to carry them to the winner's flag even though they must stop en route for more fuel and a tire change. One fast stop in the pit consumes about as much time as driving one lap.

Some drivers will do their best to "get in front and stay in front," strategy that is most likely to pay off if wet weather causes part of the race to be run under the yellow

flag that means "Caution—hold your position." Still other drivers will strive to maintain the exact speed that they have estimated the winner will average. Driving more conservatively, they reduce the chance of mechanical failure.

* * * * *

By Thomas E. Stimson, Jr.

Four years' improvements are being built into cars that will compete for the checkered flag in the first Indianapolis classic since 1941

* * * * *



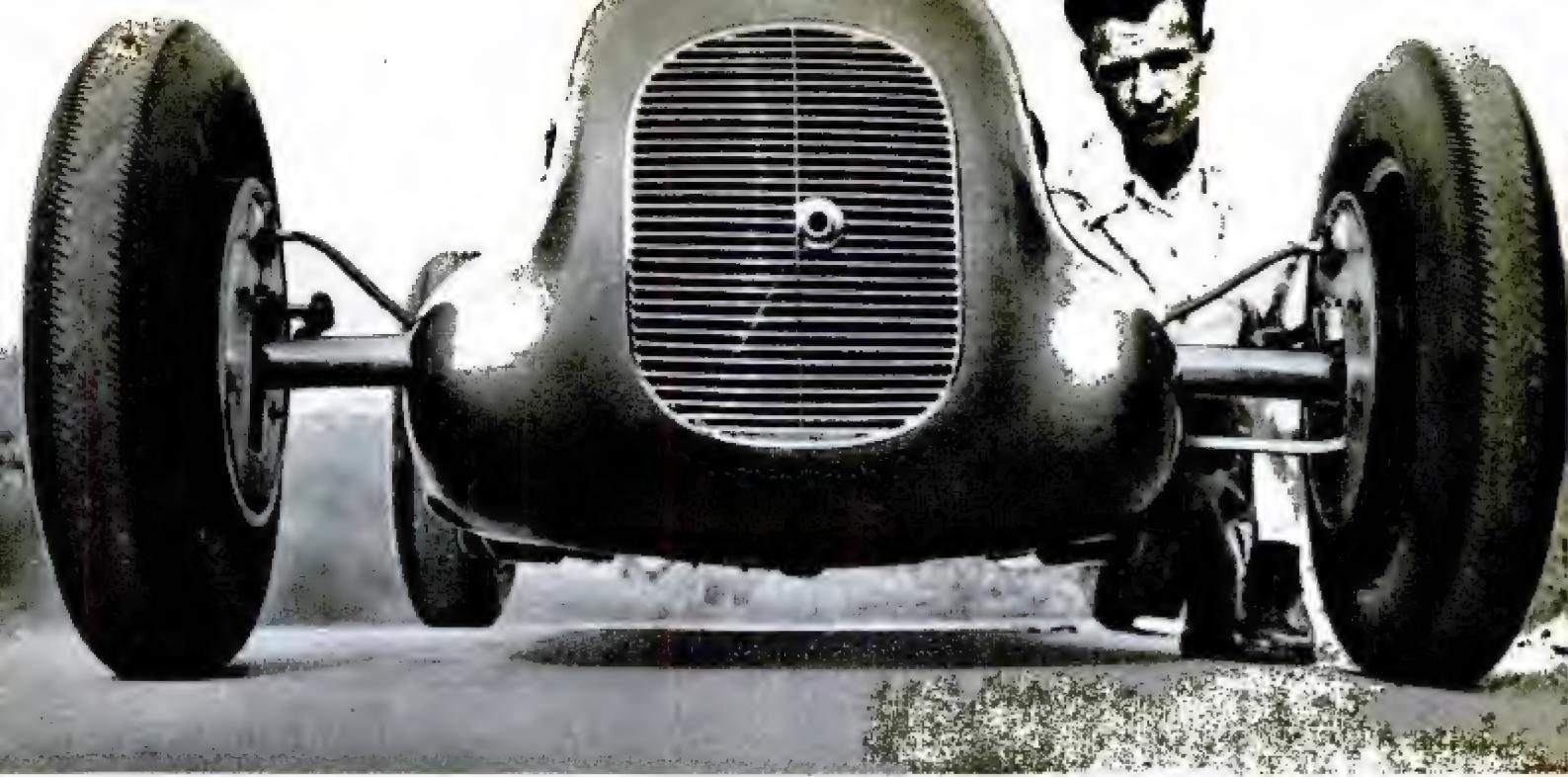
These two views of a "special" show the stable low-slung chassis and the supercharged 16-cylinder engine



Slowing down for the turns has always been a handicap. A car that can do 175 miles per hour in the stretches must slow to around 110 miles per hour for each of the four corners on the Indianapolis track. A few miles per hour extra speed in the turns would be a tremendous advantage, and each driver has his own idea for getting that extra speed this year.

Some have lowered the center of gravity of their cars so that they can take the turns faster and still stay on the track. Some are depending on front-end-drives to pull them through the corners faster than ever before without broadsiding. And at least one car now under construction will have power on all four wheels to provide the traction that is needed.

There will be no jet engines or other radical innovations among the competing cars. It takes a good nine months of engineering and shop work to put a new racing car together. Although a few owners are building brand new cars for this year's race, most of the cars are veterans of one or more prewar races. These include fours, sixes and eights, supercharged and nonsupercharged, plus the Spike Jones Special. This car, to be driven by Gordon Schröder, is powered by a 16-



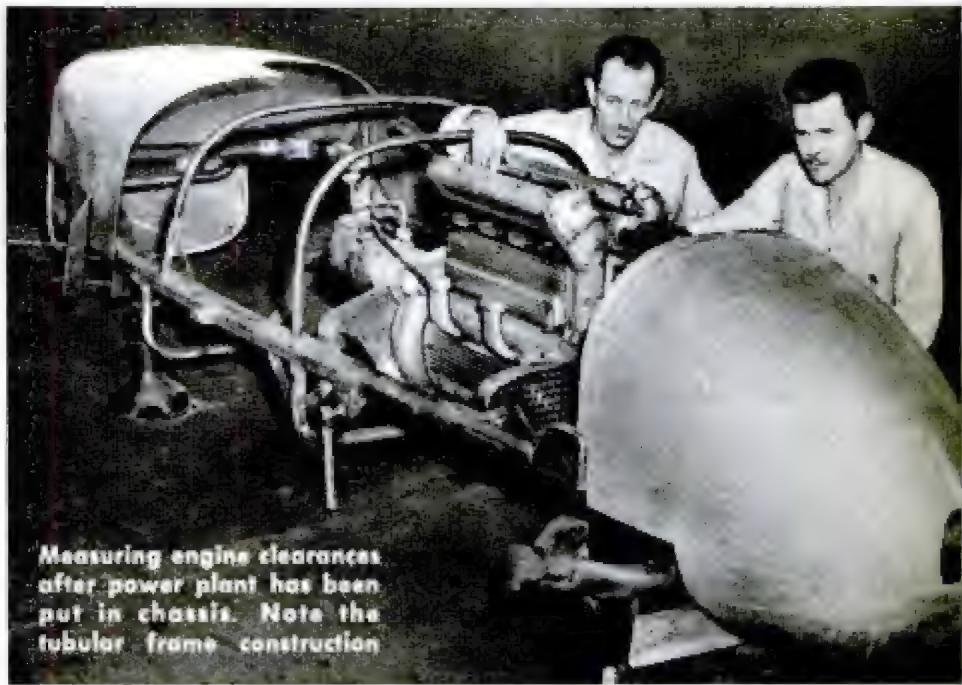
Wheels of the Spike Jones Special are almost as high as the buglike front end. Note the extremely low ground clearance

cylinder supercharged engine of 183 cubic inches displacement. The engine was used originally in the Stutz in which Frank Lockhart was killed at Daytona Beach in 1928. In spite of its age it is considered new, for it has been raced for only a few thousand miles.

Minor changes are being made in nearly all of the older cars to increase their power and improve their handling in the turns. Radiators and clutches, two weak points that have caused numerous cars to drop out of past races, have received special attention in this year's prerace overhauls.

One of the various new cars under construction this spring will have twin power plants. Planned by Lou Fageol, the car will have one standard midget racing engine over its front axle, delivering power to the front wheels, and a duplicate engine in the rear for powering the rear wheels. Both engines will be supercharged and the total power of the combination will amount to about 300 horsepower.

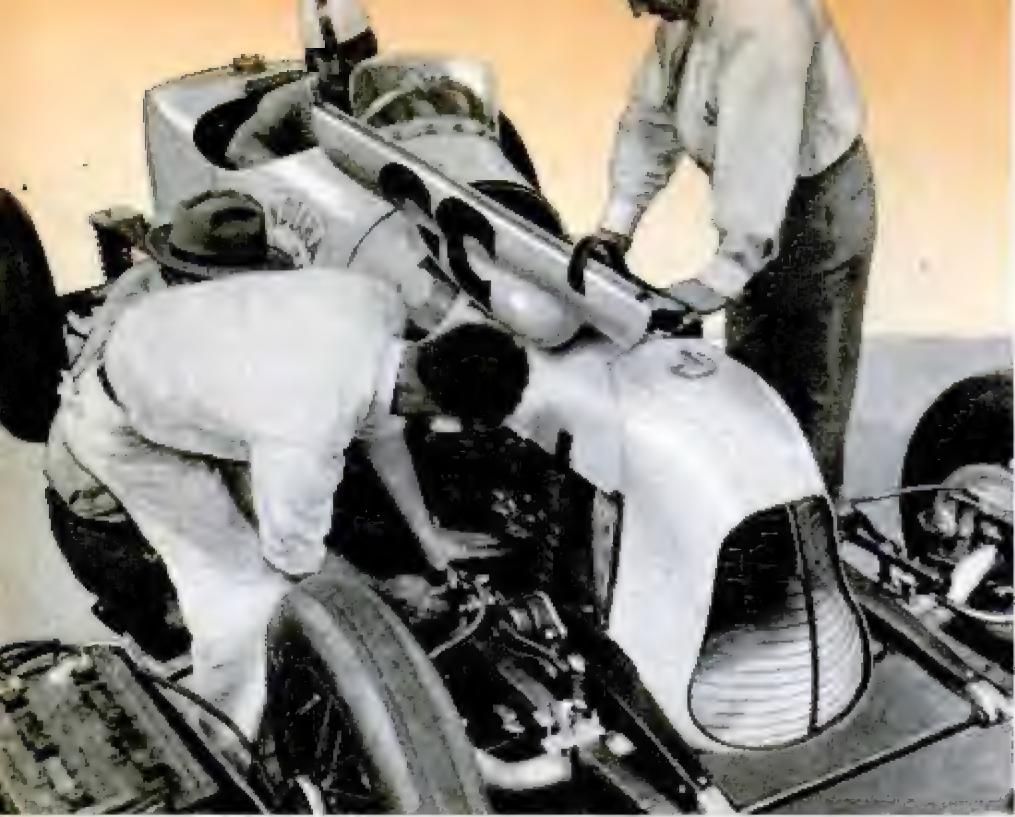
Two cars recently were built in the same shop in Chicago. They are owned by Joe Lencki. One is a six-cylinder job that will be driven in the race by champion Mauri Rose, cowinner of the



Measuring engine clearances after power plant has been put in chassis. Note the tubular frame construction



Triple carburetors, supercharger and inter-cooler of the front end drive Novi being groomed for 1946 race



Pitmen give an Indianapolis car a last minute tuneup. During the race they coach the driver from the pit

last international speed engagement. Its four-cylinder mate will have Tony Bettenhausen at the wheel.

Both cars are equipped with new disk brakes, compound carburetion, oil cooling and other late improvements. The power plants are of the high compression (16 to 1) high speed type, developed to reach maximum efficiency without supercharging. Both are rated at 265 cubic inch displacement, the six turning up to 6000 revolutions per minute and the four to 5000.

The "Lenki Cocktail," a secret formula of alcohol-petroleum fuel, will power the engines. Both cars were designed so that they can be adapted to dirt track racing as well as the Indianapolis run.

Another new car that incorporates a number of advanced ideas is the Novi Governor Special, a low, bullet-shaped front-end-drive job designed and engineered by Bud Winfield and Leo Goossens of Los Angeles for an eastern owner. The two engineers also designed the 500-horsepower supercharged V-8 engine that will power the car. Doc Williams has been named as tentative driver.

The tallest part of this car stands 36 inches above the track and the car's hood is an inch lower than its 33-inch diameter tires. Clearance under the crankcase is only $5\frac{1}{4}$ inches.

Weight is concentrated at the front end to an unusual degree to provide the best traction under all circumstances. The engine is ahead of its usual position, the oil tank and oil radiator are carried in the pro-

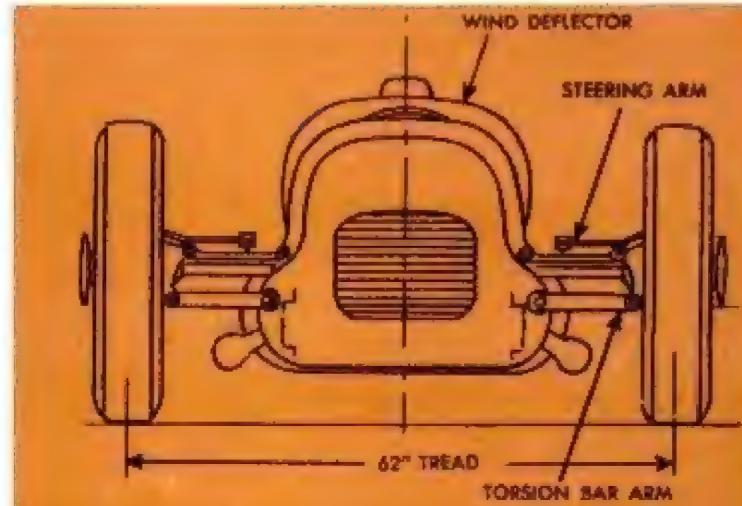
jecting front end, and the three-speed transmission is slung under the front axle. Front tread is 62 inches, six inches wider than the rear tread.

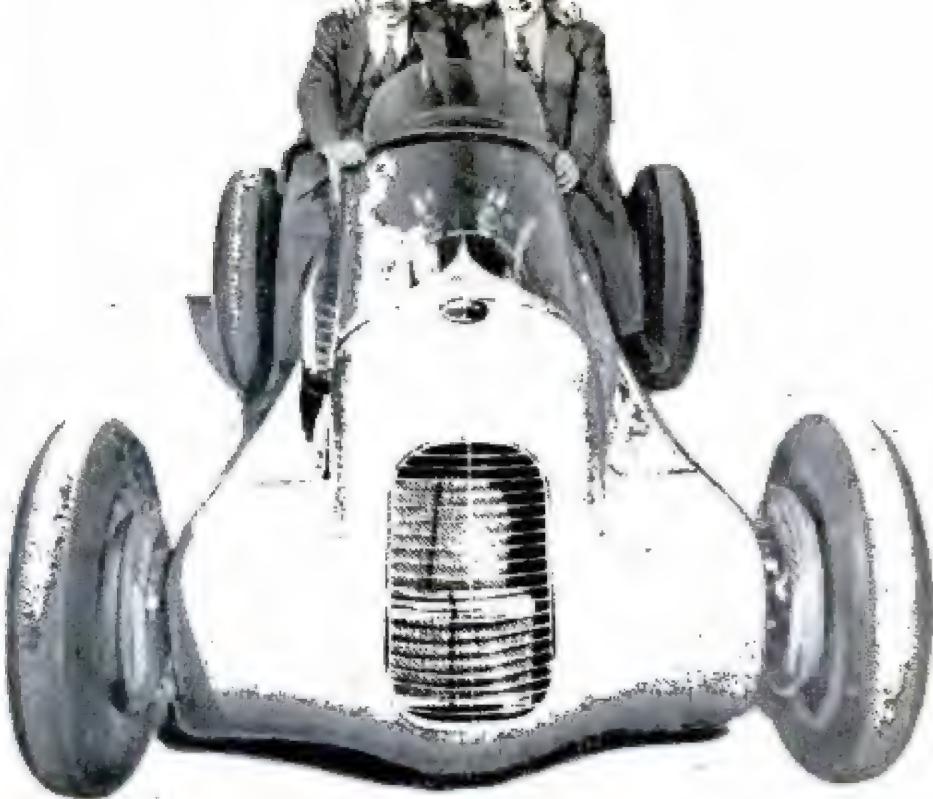
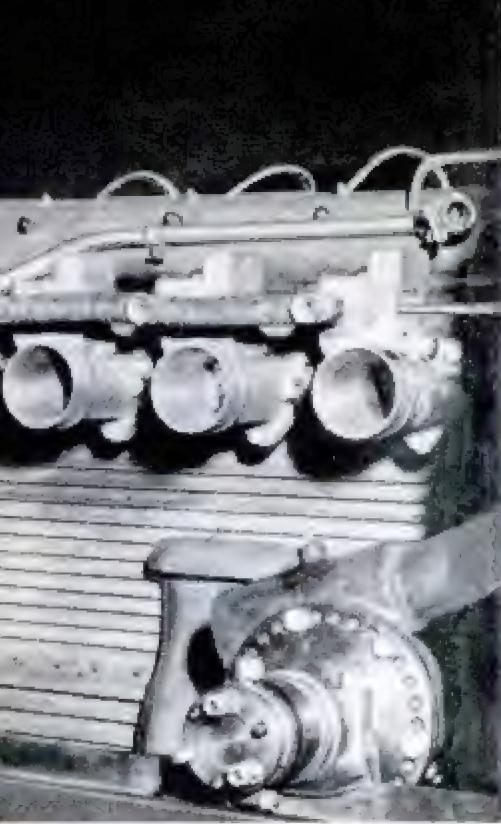
All of these features are designed to allow the driver to take the turns some 15 miles per hour faster than usual without excessive sliding.

Body of the Novi Governor Special is of sheet aluminum over a "chrome moly" frame. One innovation is the use of steel castings for the steering knuckle and steering knuckle support instead of conventional forgings. Modern steel castings, developed during the war, are as strong or stronger than forgings after heat treatment. They can be cast to within $\frac{1}{4}$ inch of final dimensions and thus eliminate much of the usual machining, and they contain no blow holes or other flaws. They are X-rayed and Magnaflux inspected prior to use.

The overhead valve V-8 engine that will power this car develops 500 horsepower at

Front view of the Novi Special front-end-drive car





Engine (above left) has six carburetors. Mauri Rose, cowinner of last race, sits at left in his latest entry

8000 revolutions per minute, nearly three horsepower per cubic inch of displacement. Supercharged, it pulls 90 inches of manifold pressure. This engine, built by Offenhauser, placed fourth in the last Indianapolis race in 1941 when it was raced on a different chassis.

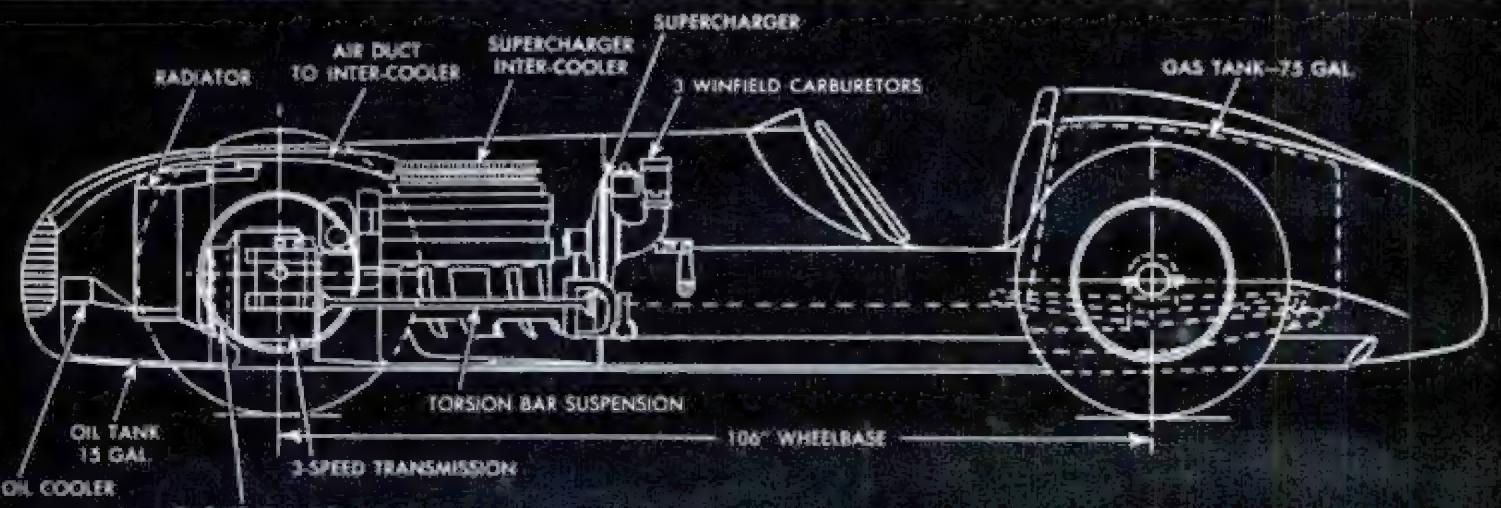
Fifteen gallons of mineral oil are carried by this car in an aluminum tank forward of the front axle, and 75 gallons of alcohol-gasoline blended fuel are carried in a tank over the rear axle. One gallon of fuel will carry the car four miles at high speeds. The cooling system is sealed under pressure and uses ethylene glycol as coolant.

Another low-slung car, being built by Frank Kurtis of Glendale, Calif., for Ross Page, stands only 34 inches above the track. Chassis and body frame were put together by aircraft technique, using "chrome moly" steel tubing up to $2\frac{1}{8}$ inches in

diameter. The entire car weighs only 1650 pounds, some 300 pounds less than average. It is powered by a four-cylinder 183-cubic-inch Offenhauser engine equipped with a Roots blower. The 72-gallon fuel tank is in the shape of a long narrow box beside the driver and is equipped with interior anti-surge baffles. This tank arrangement gives the car identical handling characteristics no matter whether the tank is full or practically empty.

There have been few race cars at Indianapolis for years that didn't have in them somewhere a few shackles or other parts made for standard cars. All race car designers make use of standard automotive parts wherever they can. Stock parts are cheaper and just as dependable as any that must be built especially for a specific car and are to be found in racing creations that cost as much as \$25,000.

Cutaway plan view of the Novi. As much weight as possible is centered above front wheels to improve traction





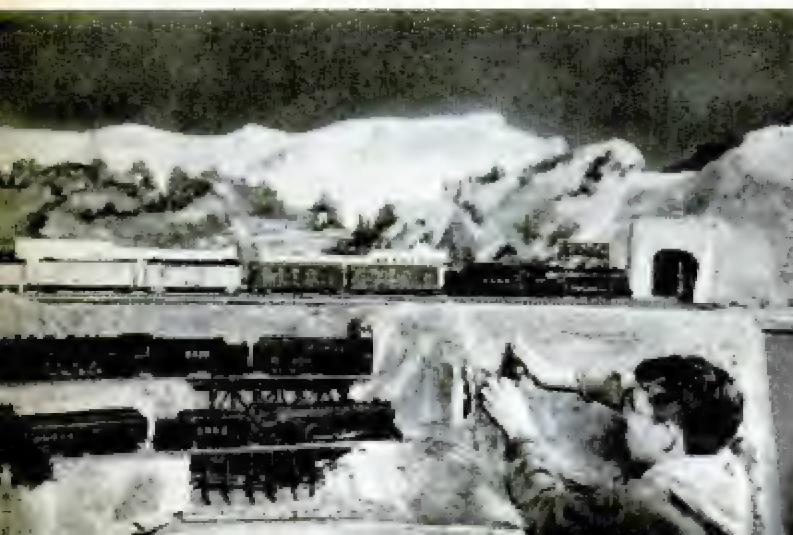
"On the-Koshare and the Santa Fe"

La Junta, Colo., division point on the Santa Fe, is the site of the Koshare, Atchison, Topeka and Santa Fe—model line built by young railroaders, many of them sons of Santa Fe men. "Koshare" is Indian for "playmakers"



Photos courtesy Santa Fe Ry.

Boy Scouts built the railroad and much of its equipment during the past seven years in the home of J. F. Bur-shears, scoutmaster. Trains patterned after those of the Santa Fe operate on the "Koshare" branch which includes a typical Colorado mountain background. The track runs through two miniature towns, El Rito (little valley) and Cemi del Mundo (on top of the moon). The control board includes a sketch of the layout. When one section of the road was completed, a pin-sized golden spike was driven and a monument erected on the spot



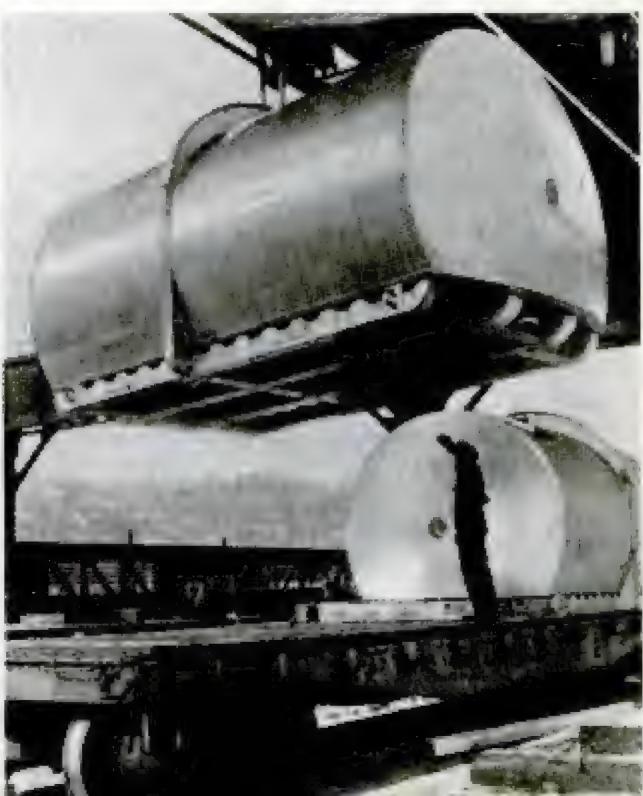
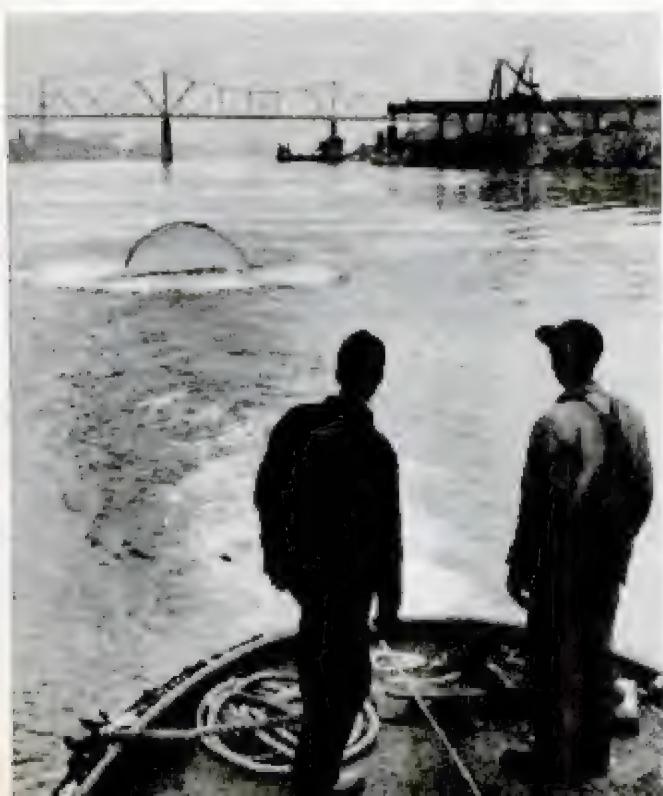


Speeds up to 60 miles per hour are possible with the new Crosley automobile that will operate 50 miles on a gallon of ordinary gasoline. Aluminum has replaced steel in construction reducing total weight to only 1000 pounds. Streamlined in appearance, the car is given an etched satin finish that resembles the highly polished fuselage of an airplane. The engine is not much larger than a standard typewriter, yet produces 26 horsepower at 5000 revolutions per minute. It is built of thin sheet-steel stampings instead of heavy forgings and castings. The stampings are crimped

Aluminum Car With Tiny Engine Goes 50 Miles on Gallon of Gas

together and braced by rivets and copper into tight joints. These engine walls permit efficient cooling of the cylinders. Low fuel consumption is possible because of the high ratio of compression. Although the pump forces 12 gallons of water through the cooling system per minute, the engine and radiator hold only five quarts. The automobile has two seats in front, two in back, and a luggage space 25 by 40 inches. From bumper to bumper it measures 145 inches, with a 40-inch tread. The gear shift is standard with three speeds forward and one reverse.

"Canned" Army Equipment Passes Dunking Test—Huge metal cans, built to serve as protective containers for U. S. Army equipment while in storage, recently passed a dunking test in the Ohio River. The waterproof containers can be tossed overboard where there are no dock facilities and then be towed ashore by small boats or allowed to wash ashore.



POSE YOUR ACTION PHOTOS!



The camera was on the ground for this low-angle shot of a galloping flagbearer. Shutter speed was 1/1000. The fast action captured in the log-rolling contest was the result of many tries





Big Brother forgot about being camera shy when told to steal some of Little Brother's ice cream. Two flash bulbs provided light

MOST of those wonderful action shots that excite every photographer didn't just happen in front of some lucky amateur's camera. They were planned, posed pictures. No, they don't look it! But that's where scheming comes in.

To shoot those flesh-and-blood, panting, action pictures you have to do a little scheming. Perhaps not always, because once in each photographer's lifetime the action that gives him the picture to end all pictures occurs right in front of his poised shutter. But before you grow old waiting for that great moment, try your hand at posed action shots.

When planned correctly, posed action pictures look fresh without being stiff. They are almost certain to have photographic qualities superior to that once-in-a-lifetime classic.

Posed action is planned this way: (1) Choose a location. (2) Focus on a target spot. (3) Rehearse action across

By Richard W. Emery the target. (4) Shoot plenty of negatives.

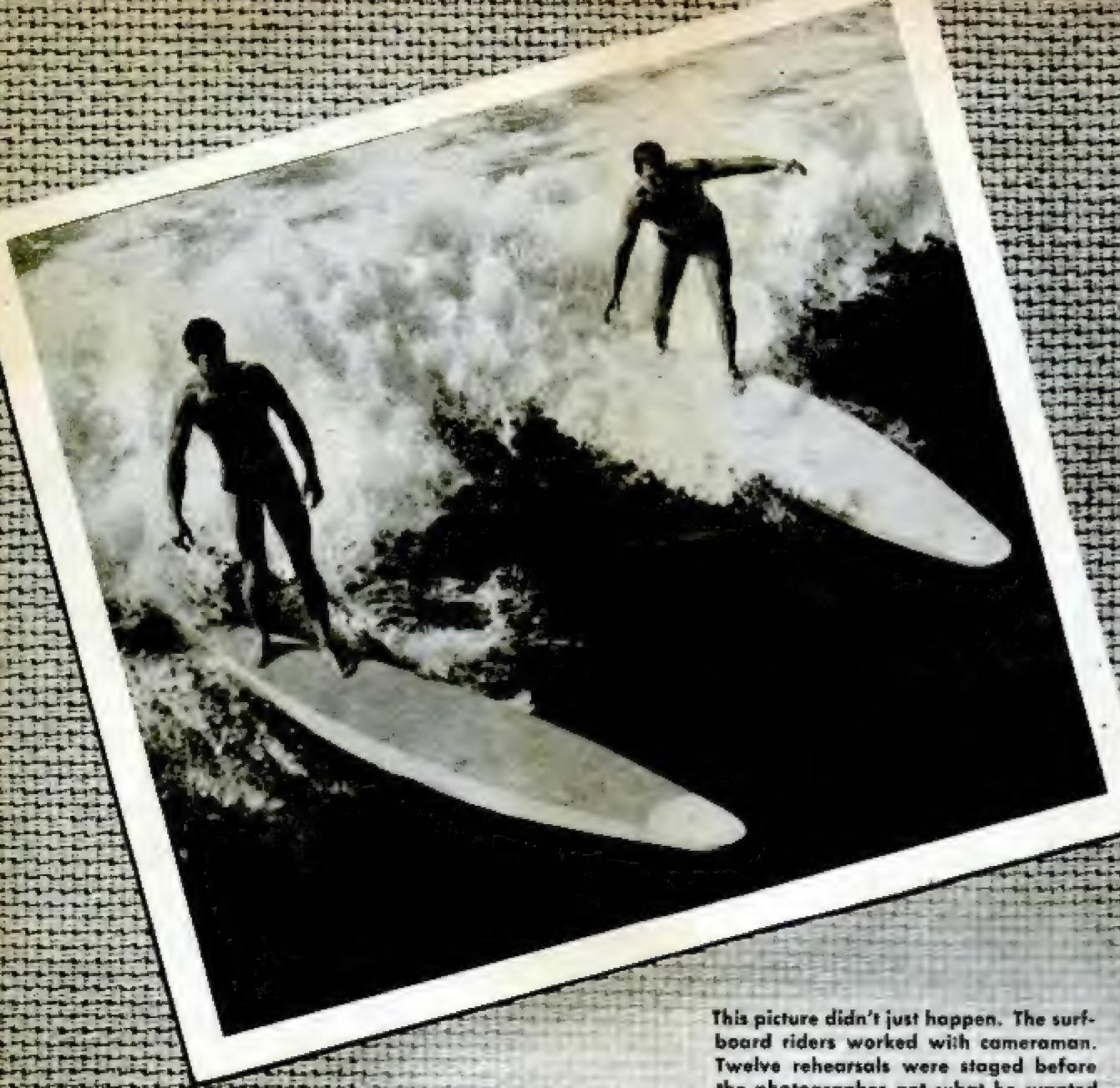
All the accompanying photos are posed action shots, planned in strict accordance with the ABCs of photography. They were selected to illustrate two points—that an action picture has more sparkle and permanent life than a picture without action, and that it is possible to pose an action shot which will look natural.

By posing action you can shoot slower, an advantage if your camera does not have a fast shutter speed. Action coming toward the camera can be shot at half the speed of action crossing the camera's field. With the new cameras, advanced amateurs will have as good equipment as the professionals. Using professional scheming, amateurs can snap as good pictures as anyone.

Here's the routine:

Choose a location. Select a logical background suitable for the mood of your picture. Check the source of light. It

Photographs by Ray Chapin



This picture didn't just happen. The surf-board riders worked with cameraman. Twelve rehearsals were staged before the photographer got what he wanted

should be behind you—unless you're shooting some trick picture with speed-gun or reflectors. Everything in the picture must harmonize with the model or models and the planned action.

Select the exact spot where the model or models will stand. This spot is your target. Put the model on the spot, set up the camera and get the model in focus. Decide on your camera angle—which will accent action, slim the model and lower the horizon; or a higher spot which will deepen the foreground and show, for example, all the people in a big group, but make your models look top-heavy.

Rehearse the action. Arrange composition to fill the negative almost completely. Get close. Study the rehearsals so that you will know the split second when the action is best, and rehearse

until that action occurs on the target.

Some kinds of action will permit the model to stay in one place—Junior feeding the dog, or Grandpa lighting his pipe. Violent action, such as running or fast walking, calls for target shooting. You may be able to mark out the target for your models. They rehearse by walking, running, riding horseback, sailing a boat—or whatever they're doing—from a point out of range, directly across the target and out of range again.

Coach your model or models to ignore the camera. If several persons are in your picture, have them walk in step and look at some designated object out of line with the camera. Or have them strolling out of step, talking to each other. If the picture is to show a person working, have him watch his work. "Mugging" stamps a picture as posed.



The right background is very important to successful photography as demonstrated by the picture of golfers framed by palm trees and outlined against the sky. To get "Yip-ee" atmosphere so the riders could speed up the photographer tore down a fence so the riders in shot below the





"One, two, three, four," counted the photographer so the drum majorettes would be in step. The problem was to shoot fast enough while the diaphragm was closed way down for depth of focus. It took an hour of shooting to "catch" the speedboat in air





Cooperating with the photographer, sailboat enthusiasts almost toppled into the water but picture turned out fine. Shiprigger (below) worked slowly for good action shot



Shoot the picture. But don't stop at one shot. Shoot the same action a half-dozen times or more. There are several reasons for making a number of shots. One is that you may have to discard negatives because of grotesque or awkward poses or facial expressions. Another is that some negatives may show your models with faces hidden, or with arms or legs reaching beyond the picture. And a third big reason is that one of the negatives will be much better than any of the others.

That's the scheming. It turns out posed action pictures that move and breathe. It gets away from totem-pole shots. It gives the old family album a new flavor. It makes the photographer blush with pride and it saves a lifetime of waiting.



Ernest Maunder of St. John's, Newfoundland, with his model of the lost sealing vessel, the Neptune

By Frank Cowles

WORKING in his basement hobby shop during spare time, Ernest Maunder of St. John's, Newfoundland, has recreated many of the sturdy old ships which made up Newfoundland's once-flourishing fleet of sealing vessels.

With most of the ancient ships now in Davy Jones' locker, Maunder's scale models are vivid reminders of the days when sealing was the biggest and most dangerous business in Newfoundland.

One model is a miniature replica of the sealing steamer Terra Nova, the grande dame of the sealing fleet for over half a

century. She helped rescue the ice-bound Scott expedition in the Antarctic in 1903, and was lost two years ago while freighting supplies to bases in the Far North.

Another model figured in a court inquiry after the original ship, the Viking, exploded at sea with a heavy loss of life while being used by an American, Varick Frissell, to make motion pictures of the seal fishery. Other replicas in Maunder's realistic collection include the Blue Nose, the Spray, in which Captain Joshua Slocum sailed alone around the world, and the Neptune, a Newfoundland sealer which took Peary on an expedition to the North Pole.

After deciding to make a model of a cer-

Left, from block of wood Maunder chisels nest of dories for model ship. Right, he checks mast measurements



tain ship, Maunder goes aboard, preferably on a quiet Sunday afternoon when he can browse undisturbed. He makes careful sketches of cabins, rigging, masts, lifeboats and other details, noting the exact measurements. Other specifications he secures from the skipper. Coloring of deck, hull and cabins is noted to insure authenticity.

In addition, Maunder makes photographs to supplement his drawings, using a battered Graflex which is a relic of the days when he covered early transatlantic flights for the Associated Press.

With his information complete, Maunder determines the scale, usually one-eighth or one-sixteenth inch to a foot. Then he saws to rough shape a piece of clear, dry soft pine. After he makes a set of templates, or cardboard patterns, from the drawings and photographs, Maunder is ready to begin his real work. First he roughs out the hull fairly accurately, using gouges, chisels and several sizes of files.

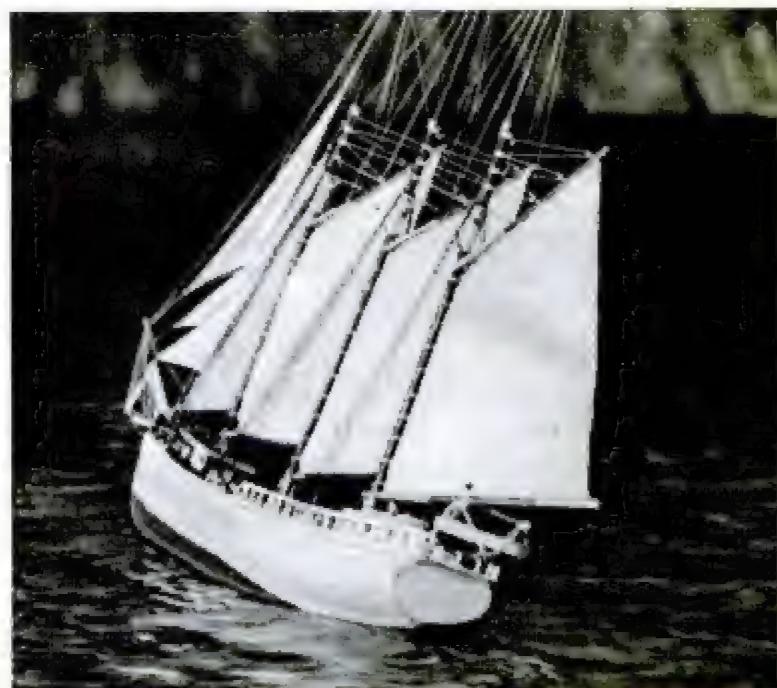
The next stage is digging out the hold to the proper depth, a job which is finished with sandpaper. The deck, also of pine, is put in place, after which cabins, hatches, dories and other fittings are added. The final stage is painting and rigging.

Maunder makes his sails of shirting, cut from patterns. To give them a weathered look, he rinses the shirting several times in water to which a pinch of dirt has been added. Ordinary twine or fishline is used for the rigging. Accessories—anchors, wheels and blocks—usually are bought, but the builder often makes his own.

Hoops for the mast are made by smearing with glue a 6-inch plane shaving and rolling it tightly around a stick. Maunder lets this dry in a cylindrical shape, smooths it inside and out with sandpaper, and slices off hoops of the desired thickness. These are dipped in shellac to bind them.

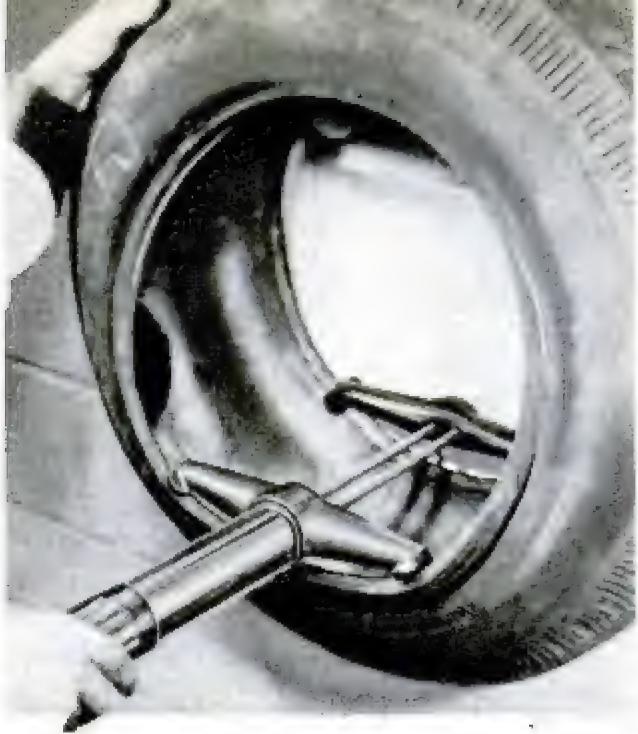


Rigging a model ship is the final step in building it



Miniature schooner heels over in light breeze. Below, davits are fitted on a scale model of the Vanguard



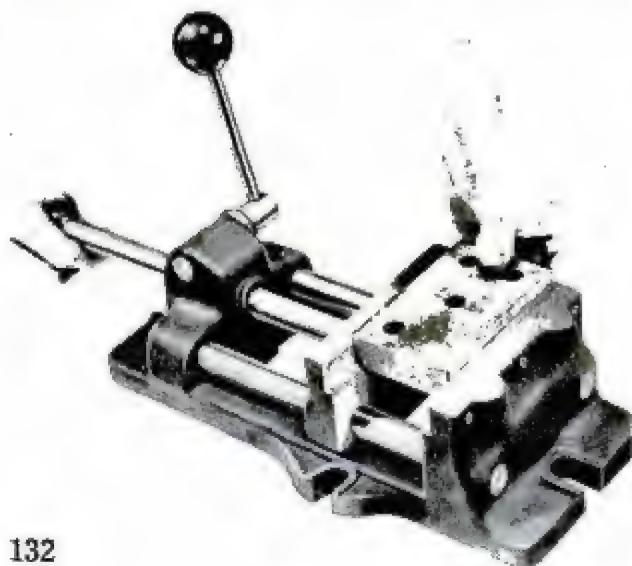


Air-Operated Tool Spreads Tires

For quick inspection and repairs on the inside of tires, an air-operated tool spreads a tire in two seconds. This permits the repairman to find cuts, bruises and loose cords and make repairs. Another twist of the tool and the tire resumes its closed position without wrinkling the patching job. The unit consists of the spreader, two wall-mounted rollers and a light to illuminate the inside of the tire. The tool can be used to demonstrate new and used tires.

Fast Operating "Push-Pull" Vise

No winding or unwinding is necessary with a screwless vise equipped with a movable jaw. The operator simply pushes or pulls a knob until the jaw is in the desired position. Then he presses down on a locking lever and the jaw is held securely in place. Available with jaw openings from 3 to 9 inches, the vise has built-in, recessed parallels to hold work pieces in position.



Inflatable Cushion for Auto Seat

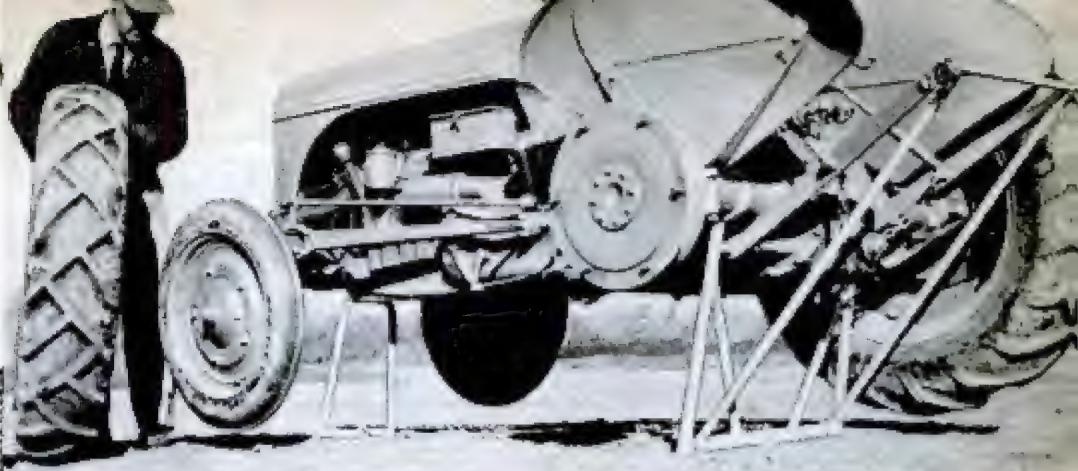
Borrowing several features from rubber life rafts and life belts, an inflatable seat cushion now is being manufactured for automobiles. Designed to fit a car seat and back, the cushion has two valves—one for each section. When deflated, the cushion can be folded compactly and stored in the glove compartment.

Tricky Holder for Baby's Bottle

Made of aluminum and weighing only 10 ounces, an automatic baby feeder invented by A. D. Bloom of Los Angeles saves mothers the trouble of either getting the baby out of bed for feeding or holding the bottle over a crib, buggy or bassinet. The holder is equipped with a semicircular supporting frame with ends curved to a 90-degree angle to serve as the base. Suspended from the top of the frame is a wire cage which holds the bottle in the correct position but permits it to be moved.



Front Page FARM NEWS

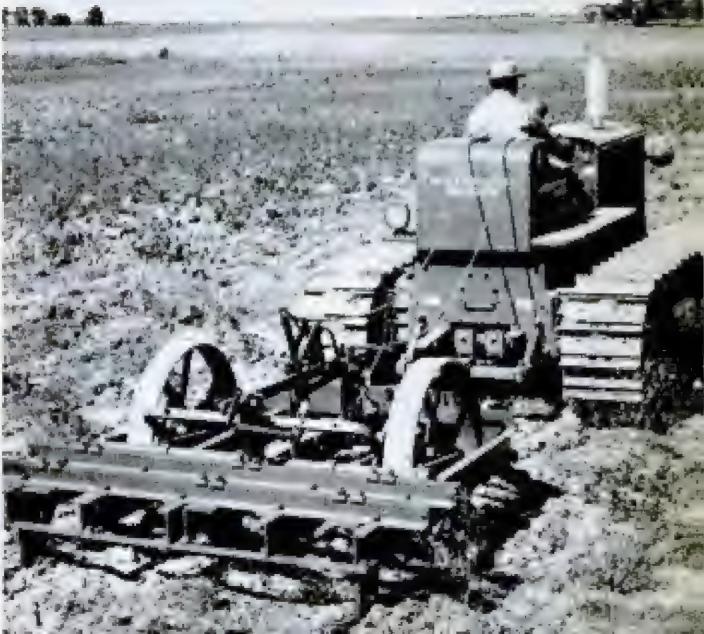
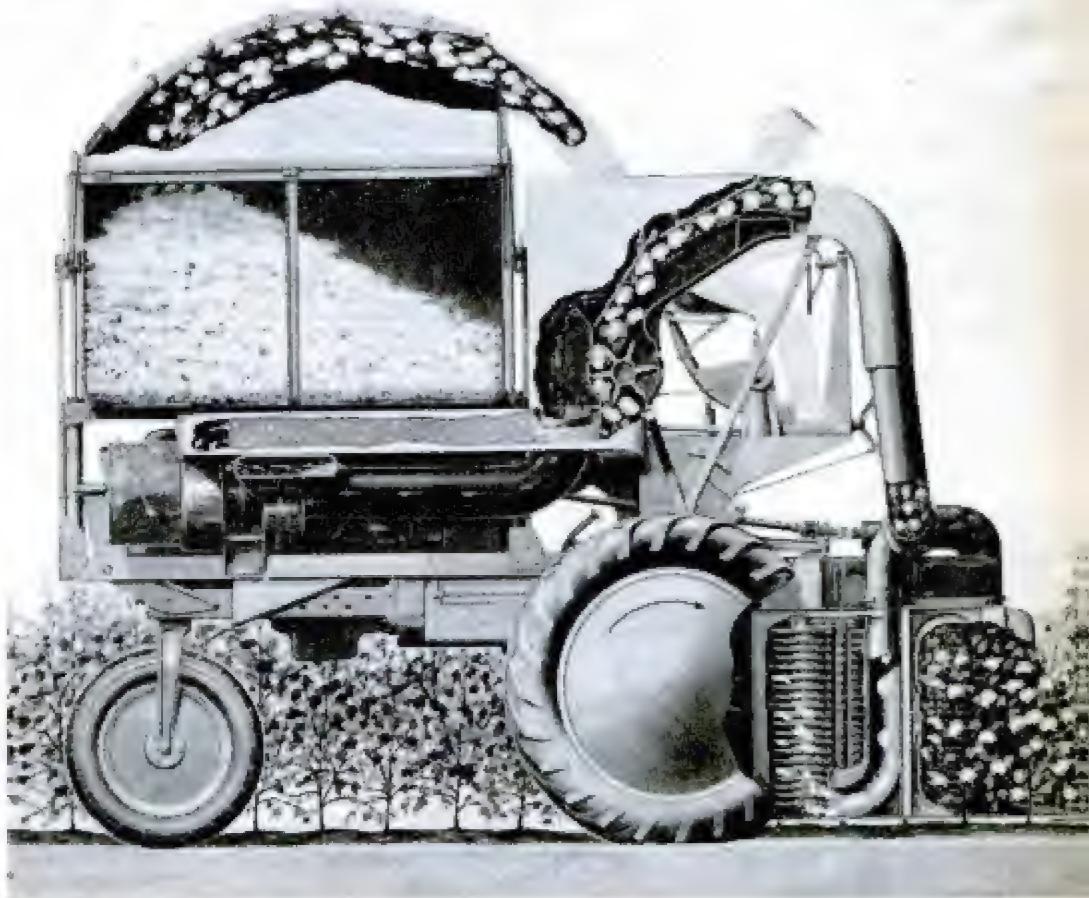


Tractor lifts itself by its own "bootstraps" (top). Finger-tip controlled hydraulic mechanism raises tractor in two minutes for tire changes

Barbed spindles of mechanical cotton picker (see cutaway drawing) pick cotton from both sides of plant. Rubber doffers remove cotton from spindles, drop it into air conveyor. The machine cleans the cotton, drops it in wagons

Vegetable planter attached to "Cub" tractor (lower left) makes gardening an easy job

Drawn by a Diesel "crawler," a subsoiler (right) breaks up hard pan and enables moisture to penetrate to plant roots, thus increasing productivity and workability



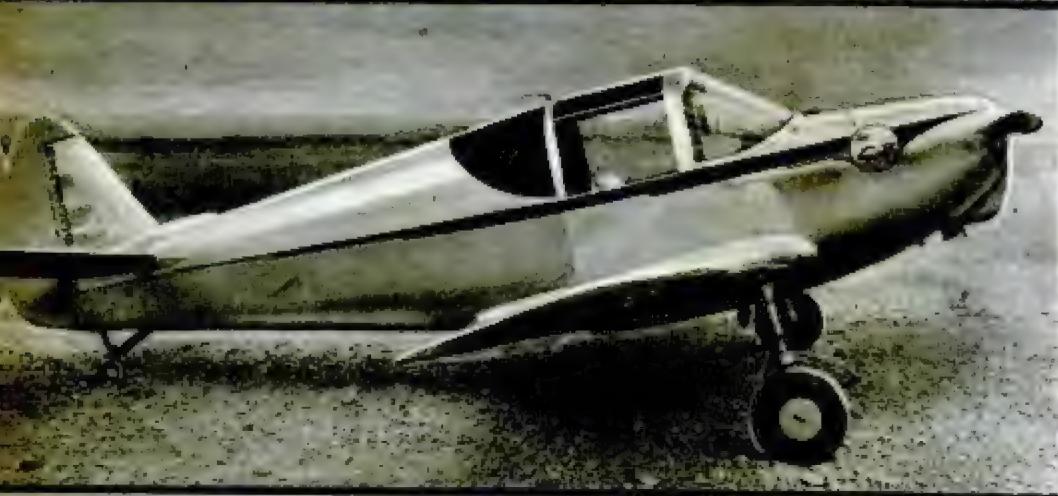
What Will

Here's What 15 Major



STINSON Voyager 150

Four-place, 150-hp. Franklin engine, fixed landing gear, range 500 mi., cruises 125 m.p.h., span 34', length 23'6", gross weight 2150 lbs. Sells for \$5000.



GLOBE Swift

Two-seater, either 85 or 125-hp. Continental engine, former's range 700 mi., cruising speed 125 m.p.h., gross weight 1570 lbs., length 19'7", span 29'4". Priced \$3495-\$3995.



KAISER-HAMMOND

Seats 4 or 5, Lycoming 220-hp. 6-cyl. aircooled engine, span 40', length 27', gross weight 2925 lbs., estimated speed 140 m.p.h., range 550 mi. Price not determined.



FAIRCHILD F 24

Ranger 175-hp. or Warner 165-hp. engine, seats 4, range 600 mi. plus, cruising speed 118 m.p.h., span 36'4", length 23'10", gross weight 2562 lbs. Sells at \$8500-\$8875.



TAYLORCRAFT Twosome

Continental 65-hp. 4-cyl. engine, range 375 mi., cruising speed 95 m.p.h., span 36', length 22', gross weight 1200 lbs. Costs \$2295.

You Fly?

Plane Builders Offer

AERONCA Champion

Tandem type 2-seater, 65-hp. engine, range 270 mi., cruising speed 90 m.p.h., span 35', length 21'6", gross weight 1220 lbs. Price \$2095.



CULVER Model V

Continental 85-hp. fuel injection engine, seats 2, span 29', length 20'6", range 700 mi. plus, useful load 681 lbs. Sells for \$3750.



CESSNA Model 140

Continental 85-hp. engine, seats 2, cruising speed 100 m.p.h., range 4 hours, features steerable tail wheel and safety landing gear. Priced at \$2495.



COMMONWEALTH Skyranger

Two-passenger, Continental 85-hp. engine, cruising speed 103 m.p.h., range 700 mi., span 34', length 21'5", gross weight 1450 lbs. Sells at about \$2800.



PIPER Skycoupe

Two-place, Franklin 4-cyl. aircooled engine, cruises 100 m.p.h., range 532 mi., span 30', length 21', gross weight 1597 lbs., fixed tricycle gear. Price not announced.



(Continued to page 136)



What Will You Fly?

(Continued from page 135)

ROCKET Model 185

Three-seater, Lycoming 185-hp. 6-cyl. engine, estimated range 1000 mi., speed 185 m.p.h., retractable tricycle gear, span 30'10", length 21'6", gross weight 2200 lbs. Price \$5000.

ERCOUPE

Two-place, Continental 75-hp. engine, cruises 110 m.p.h., range 500 mi., certified spinproof by CAA, span 30', length 20'9", gross weight 1260 lbs. Sells at \$2995.

LUSCOMBE Model 10

Single-seater, 65-hp. Continental engine, cruises 120 m.p.h. plus, span 25', length 17', loaded weight 845 lbs., fixed landing gear. Price announcement pending.

WACO

Prewar model seating 4-5, Continental engine, range 400 mi. plus, span 33'3", length 23'. Sold in \$6000 class.

NORTH AMERICAN Navion

Four-place, Continental 185-hp. engine, retractable tricycle gear, steerable nose wheel, tentative top speed 150 m.p.h., tentative range 700 mi. Expected to be in \$5000-\$6000 group.

Germs on Groceries Killed by Rays

Housewives now can return home from shopping with germ-free groceries. A new "germ-killer," designed for use in food stores, bathes the groceries in ultraviolet light. The unit is a plywood box with a large opening at one end. Baskets or carts of groceries, contaminated by handling, are placed in the box through the open end. Inside are three ultraviolet lamps that pour "condensed sunshine" over the foods. After 30 seconds the foods are withdrawn germ-free.



Silicone Oil Bath for Dry Flies

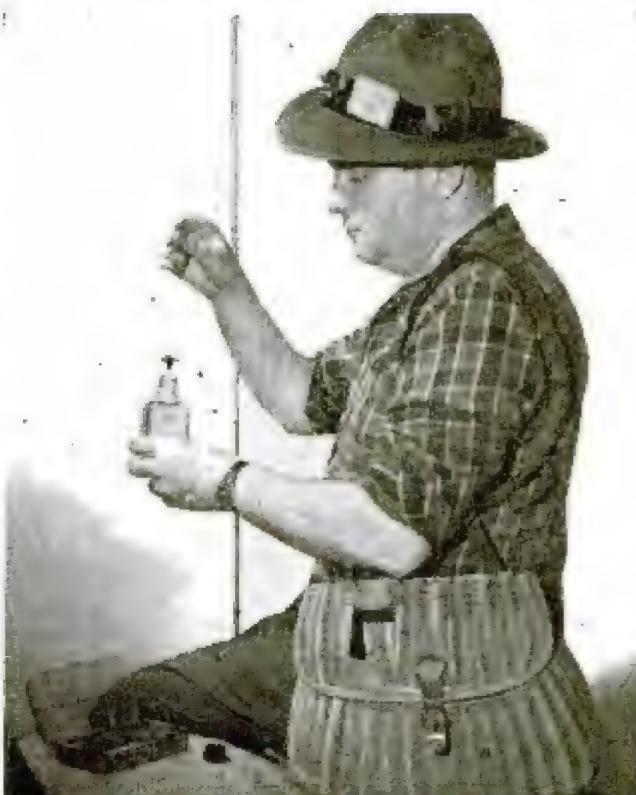
Silicone oil, new product developed from sand and coal in combination with brine, will keep a fisherman's dry flies from becoming water-soaked for long periods, according to Westinghouse researchers. Extremely water repellent, the silicone oils, which were developed for insulating purposes, also have qualities which keep them from freezing at 70 degrees below zero or breaking down at 300 degrees above, and which cause them to cling to the fly. The scarce supply of silicone oil went to top priority industries during the war.

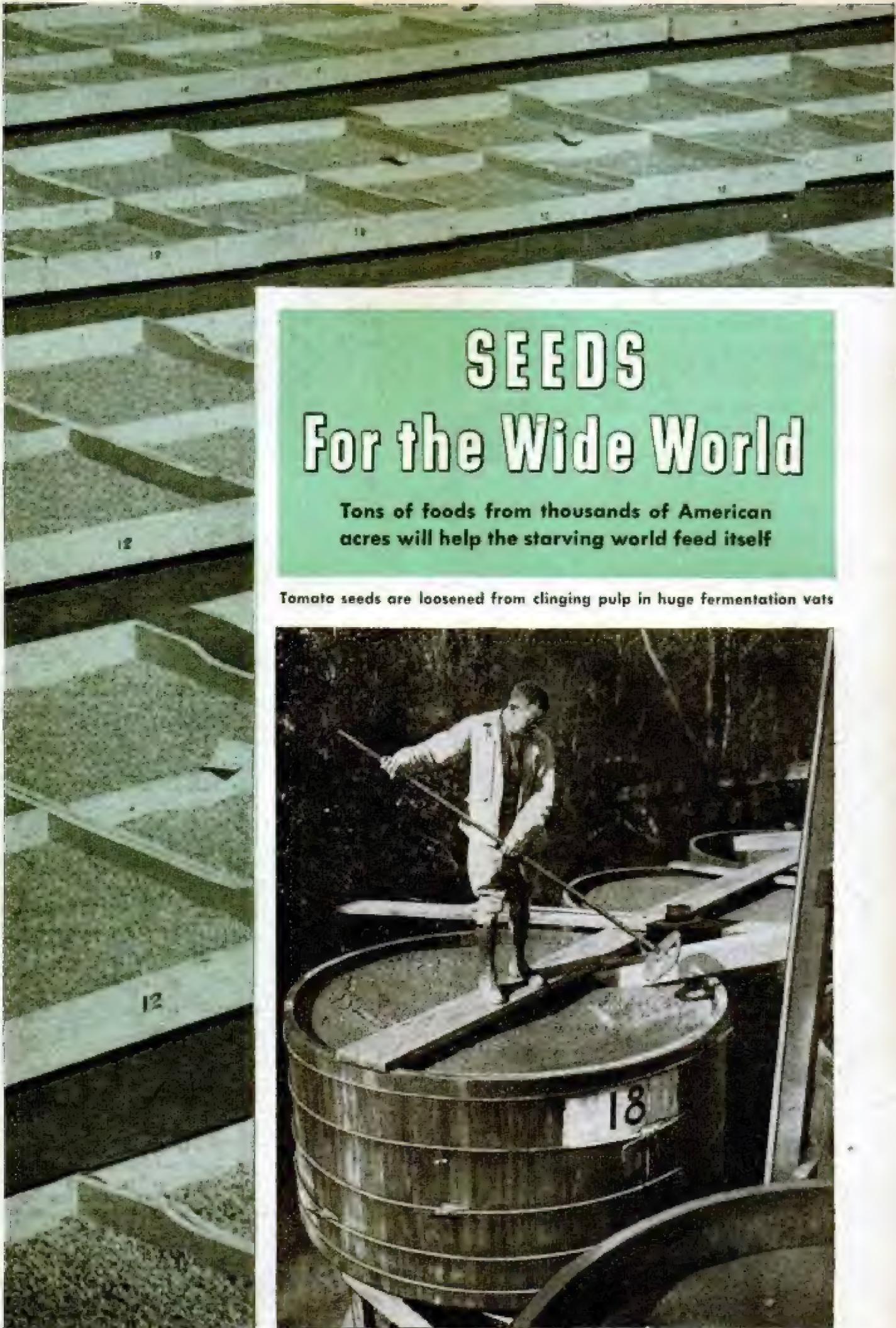
Outdoor Lamp Repels Insects

Emitting only the yellow rays which repel insects, but still providing adequate illumination, a lamp for outdoor use combines a special pigment with transparent powdered glass. This filters out the portion of the light spectrum which attracts night flying insects.

"Jackknife" Screwdriver

Fitting snugly in the handle of a large screwdriver, a smaller screwdriver can be opened up to provide additional leverage in operating the main tool or for performing work in confined areas. The shanks of both screwdrivers are made of tool steel and the handle is plastic. In the photograph at the left, the versatile tool is shown with the small screwdriver folded into the handle (center) and in two views with the attachment opened.

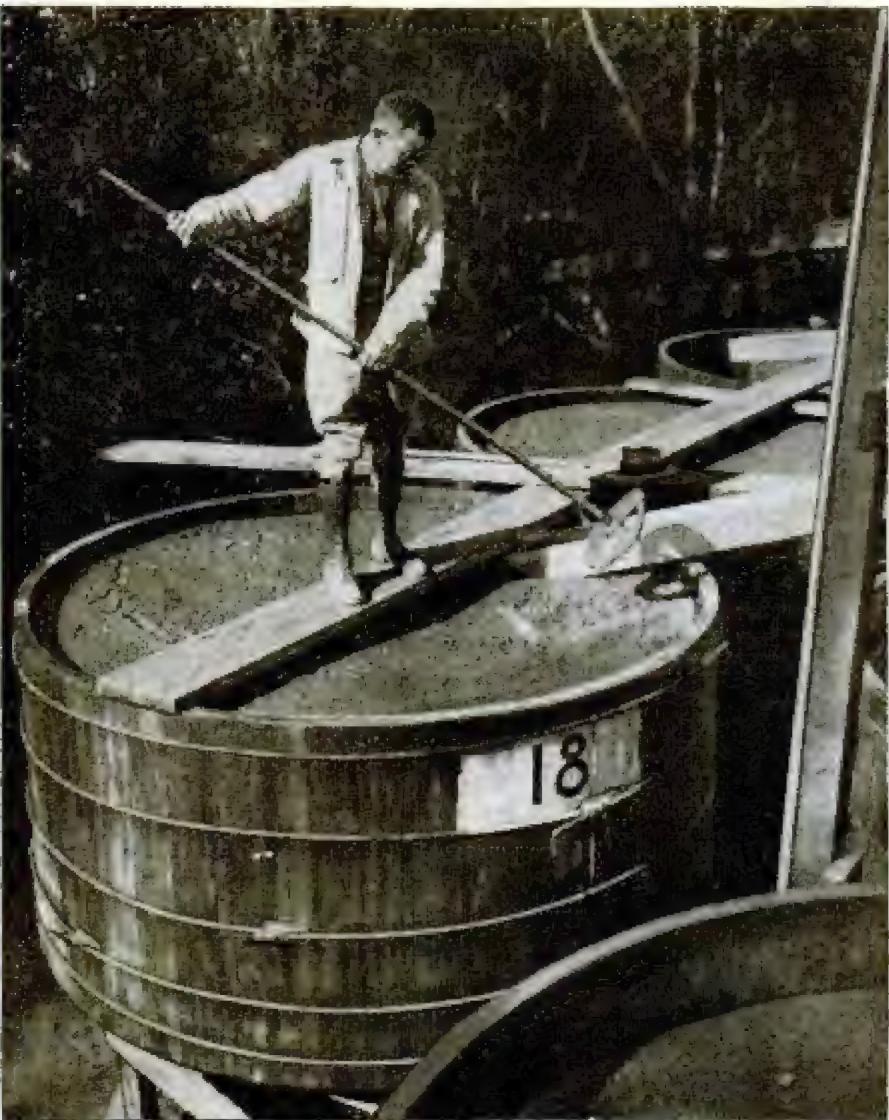




SEEDS For the Wide World

Tons of foods from thousands of American acres will help the starving world feed itself

Tomato seeds are loosened from clinging pulp in huge fermentation vats





PEOPLE in many parts of the world will eat better vegetables because of vast quantities of top quality vegetable seed the United States has furnished Europe, India, China and the South Pacific as part of its war and rehabilitation efforts.

Succulent red tomatoes, tasty melons, crisp carrots, juicy beets and a dozen other high grade vegetables of disease-resistant varieties are being grown today in regions that used to depend on poor, native-bred strains. Some of the vegetables common in this country were completely unknown in these areas until now.

The excellence of American vegetables is the result of

Trays of seed dry in sun, above. Below, suction tubes of experimental vacuum-cleaner harvester designed to pull dry seeds from their stalks





Separation of onion seed, above, from chaff is easy. In water the seed sinks and chaff is skimmed off

scientific breeding for sturdiness, size, taste, coloring and resistance to diseases. For years Europe has purchased the seed for its favorite brown head lettuce in California, for the climate on the continent is too uncertain for lettuce seeds. Similarly, England buys much of its onion seed in California. The onions flourish in England but the climate there is too cool for good seed production.

Normally the United States produces about 130 million pounds of pea, bean, corn

and other large seeds and about 70 million pounds of the smaller vegetable seeds. This production was tripled and quadrupled during the war. It is much better to ship seed abroad, to be raised into edible crops, than to transport bulkier food. Early in the war such increases in production didn't seem possible because most seed harvesting jobs were done by hand labor, and hand labor was rapidly disappearing from the farms as the busy war plants beckoned. Leaders in the industry turned to mechan-

Men feed harvester which separates seed from melon pulp

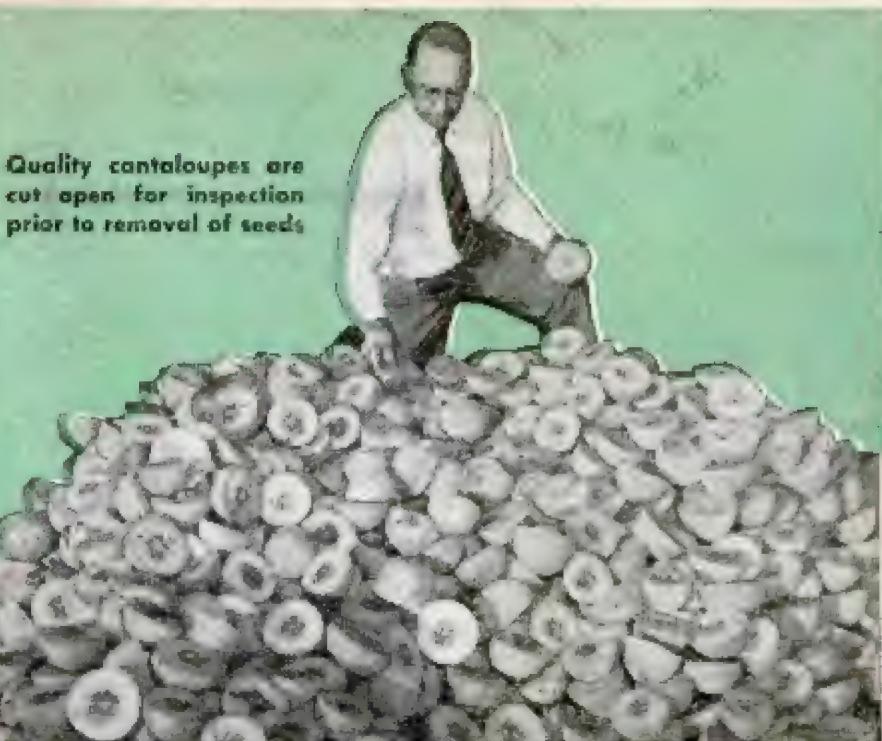


ization and devised new types of automatic equipment for harvesting.

One type of thresher developed by Ferry-Morse speeds the harvesting of seed from cantaloupes, cucumbers, pumpkins, squashes and watermelons. The thresher smashes the melons by means of ribbed cylinders and then throws the pulp inside a large rotating screen. The seeds and a small amount of pulp fall through the screen into sacks while the rinds and the balance of the pulp are discharged. The sacked seeds go to a mill for washing and drying.

The latest thresher, adapted from Army equipment, is built on a 1½-ton four-wheel-drive truck chassis and uses hydraulic pressure supplied by its engine to operate hydraulic motors that turn the conveyors, cylinders and drums.

Head lettuce won't go to seed unless the mature heads are chopped open to allow the seed stalks to push their way through. Once done by field labor, now a mechanical header with rotating disk blades is drawn down the rows, slicing open the heads of lettuce as it moves. After



Quality cantaloupes are cut open for inspection prior to removal of seeds



Seed breeder, above, makes lettuce cross on Ferry-Morse Seed Farm in California. Below, rotating screen separates tomato skins and most of pulp from tomato seeds before they go to fermentation vats for further cleaning





Vibrating table drops seeds in some sacks, chaff in others. "Selfing cage" below prevents contamination by other plants



the seed stalks have matured, a mechanical harvester cuts them down and dumps them into a trailer for hauling to the drying sheets.

One new piece of equipment is a "land planer" that shaves the ground to billiard-table smoothness. Most fields have slight hills and valleys that cause a drill seeder to plant some seed too deep and some too shallow. The land planer is a tractor-drawn iron framework 12 feet wide and 60 feet long, with a wide scraper blade at its center. Its long wheel-base permits the scraper blade to remove slight rises in the ground and to fill in depressions.

Chemical weeding has replaced most hand weeding of narrow-leaved seed crops. Sprays of light stove oil, as much as 100 gallons per acre, kill 80 percent of the early weeds in such crops as carrots, parsnips and parsley.

One of the largest producers of vegetable seed in the world raises nearly 500 separate varieties of 50 different vegetable seeds on 50,000 acres in California and other states. Some seeds are almost microscopic in size, others are as large as your thumbnail. Each is a separate problem to the mill men who must remove all chaff, stems, dirt, weed seeds and other field debris. Seeds from any of approximately 3000 weeds may need to be removed.

Three types of separation machines are used for most seeds. Fanning mills employing air pressure blow away chaff, light seeds and dust. Next, vibrating screens allow the seed to fall through while trapping all larger material. The final step, usually, is a gravity mill that has a rapid up and down and sideways motion. An air blast

Scaper of land planer levels fields for seed crop



from underneath the deck keeps the seed in partial suspension as it jogs and bounces along. The heavy seeds slowly concentrate at one side of the table and the lighter seeds, chaff and dirt are carried off at the other side.

Good onion seed is separated easily in water. The onion seed sinks and the chaff and light weed seed can be skimmed off. Beet seed is cleaned by a "hill climber" machine resembling a mechanical laundry ironer. Beet seeds roll down the canvas or rubber belt and are collected in a hopper while sticks, chaff and some weed seeds are carried away.

Tomato seeds are embedded in pulp, hence they cannot be cleaned by any of these methods. Ripe tomatoes are broken up and placed in a large rotating screen that retains the skins and most of the pulp, allowing the tomato seeds and the pulp that clings to them to fall through. This material is fermented in large vats for several days. After fermentation has loosened the seeds from the pulp the material is flowed down long sluice boxes similar to those used by placer miners in extracting gold from river sands. The seeds sink and are caught behind riffles in the bottom of the sluice box.

Ferry-Morse keeps a constant check on the quality of its seeds at laboratories in San Francisco and Detroit, trial grounds at Salinas, Calif., and a greenhouse and test garden near Rochester, Mich. A sample from each shipment of seeds goes to the nearest laboratory where it is checked for noxious weed content. Garden pea, cabbage, corn and tomato seed receive disinfecting treatment to protect them against ground rot after they have been planted.

The laboratory also makes germination tests of each shipment, in some cases placing a sample of freshly harvested seed in an icebox for several days to duplicate the winter cold weather effect. A number of the seeds then are placed on moist sterile blotters and germinated under controlled conditions of light and heat.

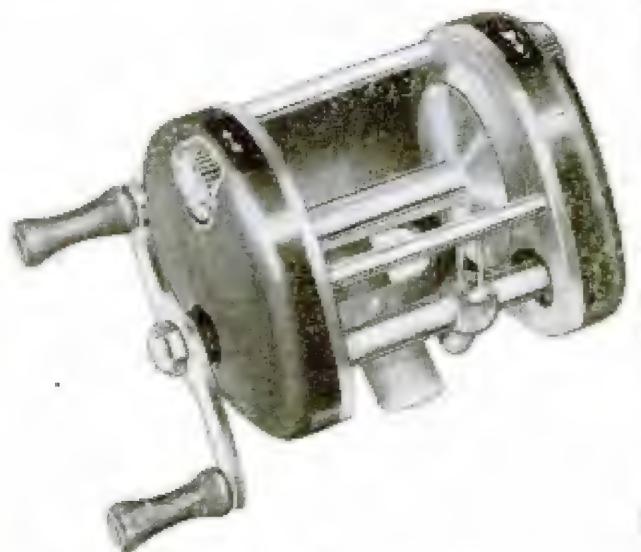
Similar tests are made of samples from each batch of seed after the milling and cleaning operations and again just before the seed is packaged. All lots of seed receive germination tests every five months as long as they are in storage.

Meanwhile, samples of seed are planted at the Salinas and Rochester trial grounds and the plants are checked for size, quality and trueness to type.

By penetrating the microscopic pores of glass, a new preparation prevents fogging, steaming and frosting of goggle lenses, face shields, welding plates and all types of glass surfaces.



TOY-SIZED PLANES mounted on an electrically operated arm go through various maneuvers, just like real aircraft, to help train student pilots. The pilots sit at the control board—similar to that of an actual plane—and put the model through its various paces



FISHING REEL equipped with a centrifugal governor eliminates backlash and automatically controls line speed. A recessed fingertip control knob on the left side of the reel has 10 settings for different types of casting. Another feature is a dual "click and drag" assembly which can be adjusted for desired tension to prevent the line from running out when trolling with heavy baits or where there are strong currents



ADJUSTABLE TYPEWRITER STAND for hospital bed patients tilts forward, supporting the typewriter at an angle to overcome the user's handicapped position



PLASTIC "LUNG" weighing only 60 pounds frees arms and legs of patients needing respiratory assistance because of polio and various circulatory diseases

UNIQUE BED TELEPHONE was developed for use of Army veterans unable to use their arms. Both receiver and mouthpiece are supported without manual aid

NEW "EYES" FOR THE BLIND are two motion picture camera lenses equipped with photoelectric cells that give off buzzing sounds when objects are approached



Bonnie Lunt. of America
741 N. Vermont
Los Angeles, California



Hit the Trail by Trailer



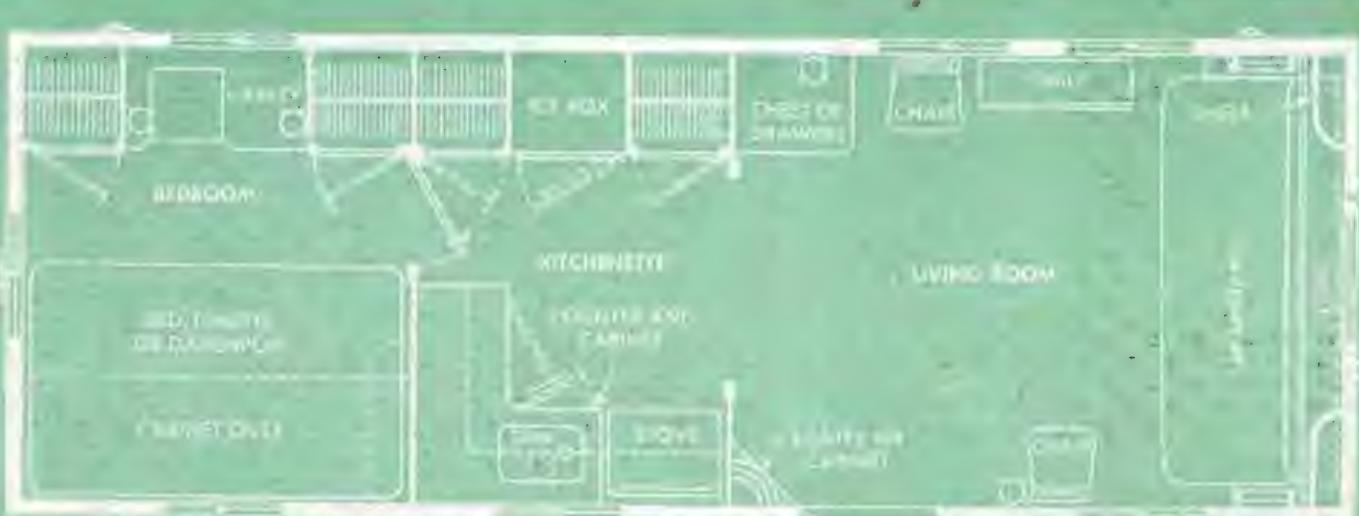
Such touches as a front porch and shutters give "Cottage Home" trailers the charm of a home of your own.

Forget about the housing shortage. Get yourself a "Cottage on Wheels," hook it up to your car and hit the road. The new trailers have three rooms and a bath, plus many new improvements.

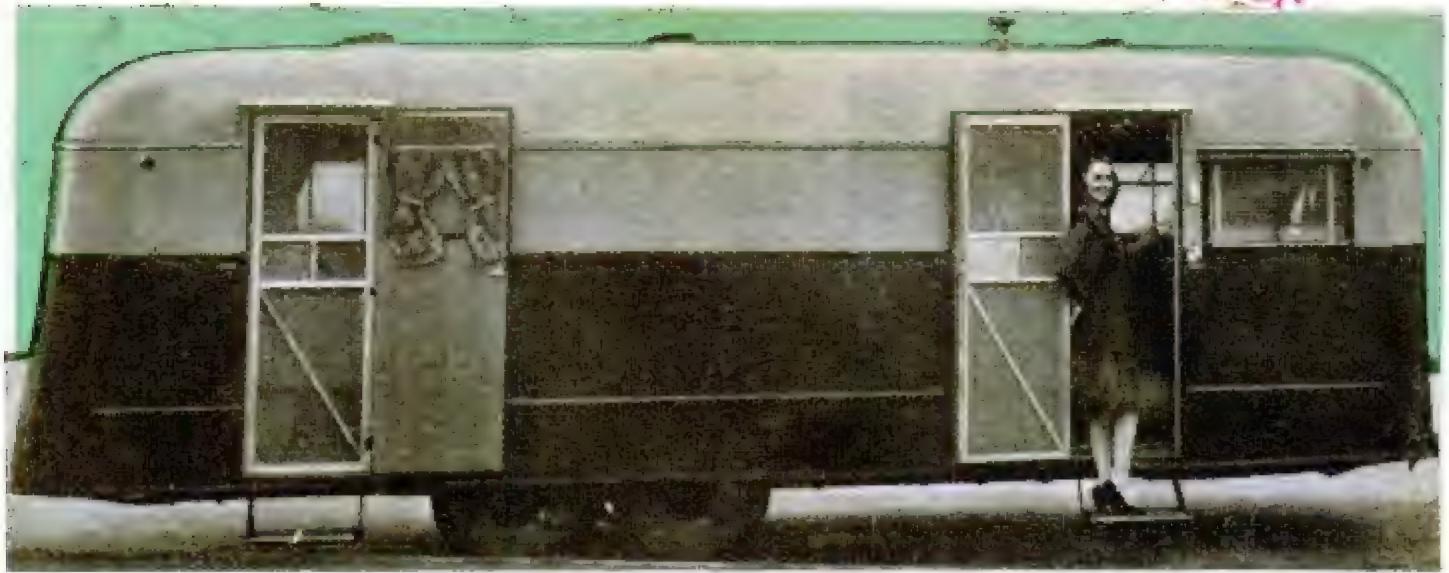
TRAILER coach manufacturers are thinking up new ideas for the combination mountain cabin, lake cottage and beach home that you've been planning to hitch behind your car for vacation trips.

Molded plastic trailers on aluminum or magnesium undergear, weighing considerably less than current models, are in the offing. Some will be equipped with tricycle running gear similar to the landing gear of aircraft for better roadability.

Electric hot water heaters, shower baths,



Trailer 35 feet long and eight feet wide has varnished natural finish inside and redwood siding on the outside.



Crown Prince Emir Abdul-Ilah of Iraq recently purchased this Schult "Luxury Liner" and the jeep to pull it

more practical toilets, fluorescent lighting and stoves with ovens and four-burner tops that use bottled gas instead of gasoline or kerosene are features of some of the new trailers.

Permanent paint jobs that require no maintenance, interior surfaces of cloth or paper bonded to fiber sheets and upholstery of synthetic materials that are easy to clean are on their way.

At least one manufacturer is planning a stand-by butane system for all cooking, heating and lighting purposes, making the trailer self-sufficient when parked in remote spots. A combination electric refrigerator and ordinary icebox that can be

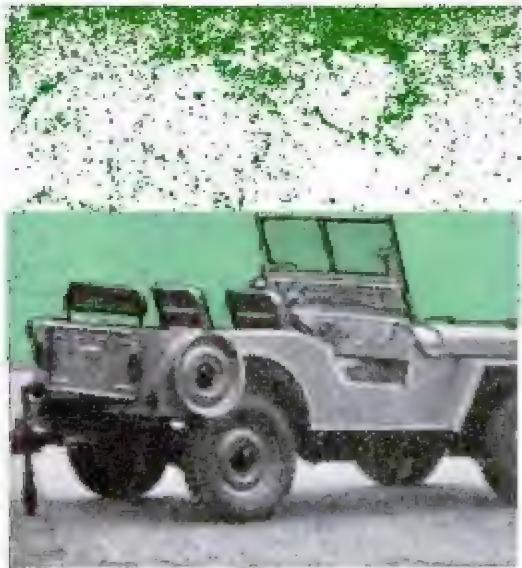
plugged into a trailer park's electric system and that also has space for an ice supply when parked away from electrical connections is about ready for market. Hydraulic brakes that operate directly from the master cylinder of the towing car are another postwar improvement.

Modern trailers got their start about a decade ago in answer to the demand of vacationists who wished to carry their eating and sleeping facilities with them on the highway. Vacations in the homes-on-wheels boomed, then the war stopped pleasure travel.

But trailer construction continued and trailer design improved by leaps and

Air cooler, icebox and shower bath fit in compactly (left). Double-deck bed with single "upstairs" sleeps three





Higgins tent folds into a trailer (top) for towing, is easily erected (below)



bounds during the war because of the need for "stop-gap housing." Federal agencies alone bought nearly 50,000 units of various stock designs for workers who needed temporary shelter.

Dozens of villages adjacent to lonely ordnance works and construction jobs were composed almost entirely of trailers. The village policeman operated from a trailer, the town hospital consisted of several trailers, and the communities often had their

Kitchen has running water, sink, electric lights, stove, cupboard, icebox



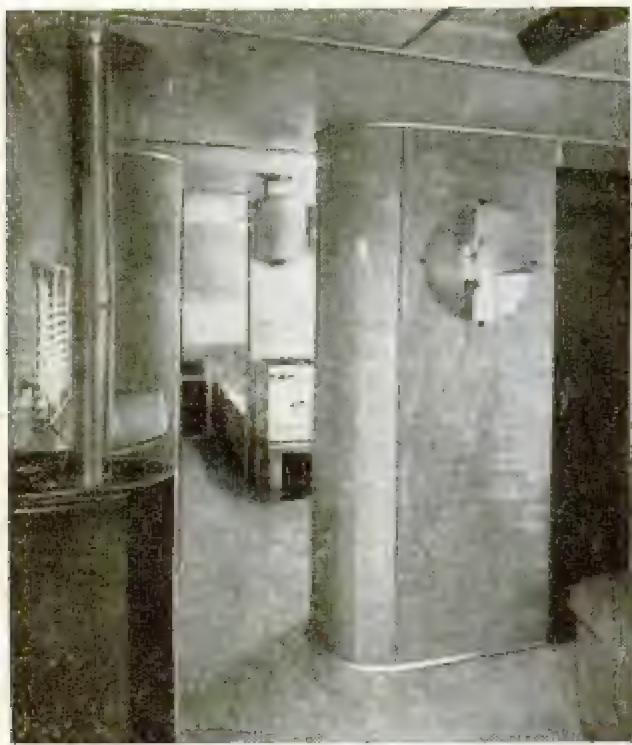
trailer-churches, trailer-schools and trailer-laundries.

Most of the wartime trailer coaches were built of plywood or wood fiber materials over steel reinforcing. They were seven or eight feet wide with an average length of 22 feet and most of them weighed 2800 pounds or more. A typical design had a living room at one end and a bedroom at the other, each containing a bed or bed-davenport, and separated by a kitchen space equipped with sink, cupboards, cooking stove and icebox. Connections for hooking into the trailer park's water and electric systems were provided. Sliding or folding doors closed off the rooms.

The war trailers had one or two entrance doors and all doors and windows were screened. The glass windows pushed outward and up, being hinged at the top, and served as transparent awnings to keep out the rain when left open. Some had oil-burning heaters with warm air conduits piping the heat under the floor to various parts of the trailer, and some also carried built-in evaporative coolers for hot weather.

Some were equipped with electric blowers for forced draft ventilation and almost all contained lightweight insulation materials in the walls and roof. Many had electric or air brakes, operated from the towing car, a requirement in many states.

One unique "Cottage Home" model is built to resemble an actual cottage on wheels, having a 25-foot-long exte-



Duo aluminum trailer (above) is 600 pounds lighter than most 28-foot units. Interior (left) of the trailer

rior that consists of painted white siding with shuttered windows and a roof of green asphalt shingles. The "attic" above the inside ceiling is vented to draw off hot air.

Depending on its size, accommodations and age, you can buy a trailer coach for from several hundred to several thousand dollars. You can spend upwards of \$15,000 for a custom-built de luxe "land yacht" or you can build a trailer yourself in your back yard. Plans and specifications are available for one light design, only 10 feet long, that contains a combination lounging, eating and sleeping room in its interior. Cooking facilities, including stove, are reached from the rear by lifting up the trailer's rear panel. Intended for week-end camping trips, the trailer has nearly all the conveniences of a full-sized trailer coach.

The trailers that the government pur-

Criss-cross coupler permits trailer to be parked parallel with the automobile to which it is attached



chased during the war will soon be placed on the market, it is expected, through regular dealer channels. Their average new cost was about \$1000 each. Some are in good condition, others have had considerable wear and tear.

The Army used hundreds of huge trailers as traveling repair shops during the war. Shoes were repaired in special trailers that moved with the troops; clothing was salvaged and reissued in others; tires were repaired in trailers carrying vulcanizing equipment, and ordnance trailers served as workshops for repairing guns.

In addition to new comforts and conveniences, the latest trailers promise vastly improved roadability over earlier models. This is being attained by weight reduction and use of a one or two-wheel auxiliary dolly under the nose of the trailer, providing a third point of contact with the road and reducing by two thirds the weight that rests on the rear springs of the towing car. The dolly does away with the need for overload springs and eliminates the swaying and pitching action that is often encountered at high speeds. Some of the first dollies to be marketed had a tendency to shimmy, an objection that is being overcome. Backing a car and trailer is sometimes more complicated with a dolly.

Heavy trailer coaches offer more difficult towing problems than do light trailers and

Dolly wheels at nose of trailer take most of weight off car. Diagram shows installation of Nelson dolly under front end of the trailer



Nelson dolly
under front end of the trailer

View of the criss-cross coupler which eliminates sidesway and zigzagging



are harder on fuel consumption and tow car maintenance. The trend is toward reducing the weight of present designs by as much as one fourth without reducing the amount of interior accommodations. One way is to take advantage of aircraft construction design instead of the ordinary house construction methods. Wood-plastic laminated materials are to be used, and one manufacturer is preparing to utilize surplus aircraft aluminum sheet stock for walls and roof with built-in insulation.

Aluminum mills are rolling structural shapes for running gear and floor support girders.

More built-in gadgets and conveniences are being provided, especially in the way of kitchen ap-

(Continued to page 236)

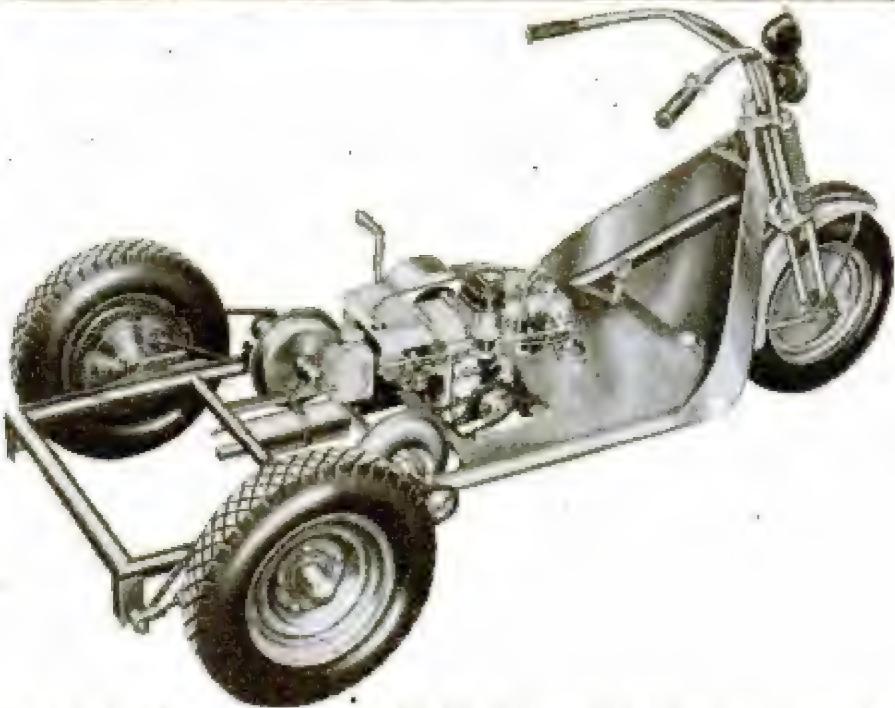
Motorcycle Truck Hauls 1000 Pounds

Equipped with fluid drive that eliminates gears and levers, a three-wheeled motorcycle truck is designed for light delivery service. It can haul 23 cubic feet of cargo weighing 1000 pounds. Powered by a two-cylinder air-cooled motor that develops 8½ horsepower, it travels up to 35 miles per hour and goes approximately 60 miles on a gallon of gasoline. The motor is designed so that its parts can be replaced by parts for several automobiles. The motorcycle truck weighs 600 pounds, is 92 inches long, 50 inches wide, has a 66-inch wheelbase and a turning radius of 14 feet.



Plastic Auto Top Is Removable

Tradition is disregarded in a custom-built automobile body designed by Raymond Loewy and equipped with a transparent plastic top for the driver's seat which can be removed for warm weather motoring. Built on a standard 1942 Lincoln Zephyr chassis, the body is six inches lower than conventional cars. Blue glass portholes are fitted into the rear dome, and

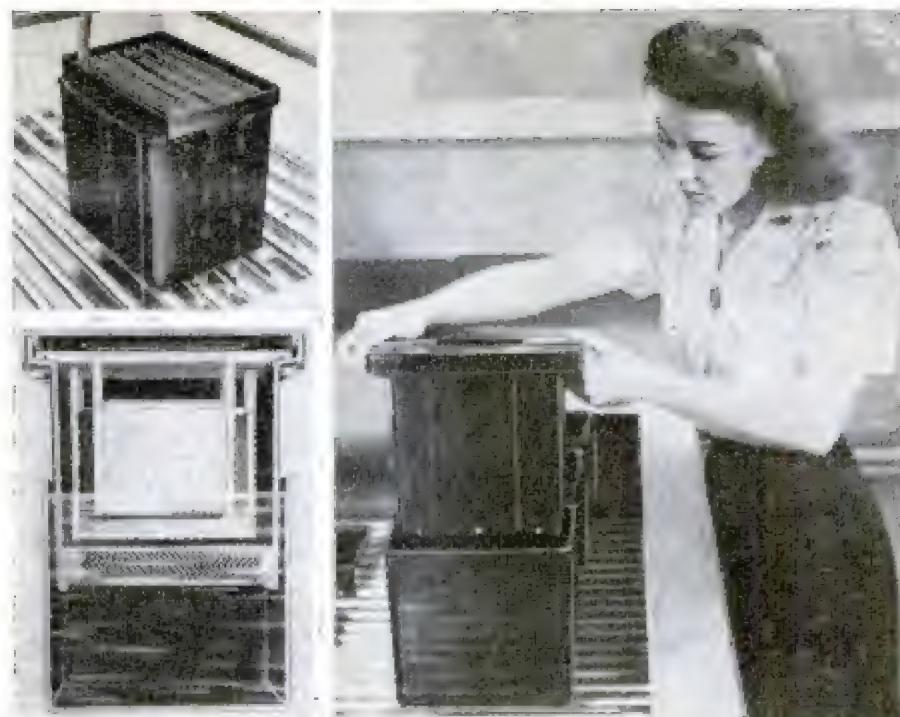


a plastic shield—hinged to the top—can be lowered between front and rear seats. A rear spotlight aids in backing up.

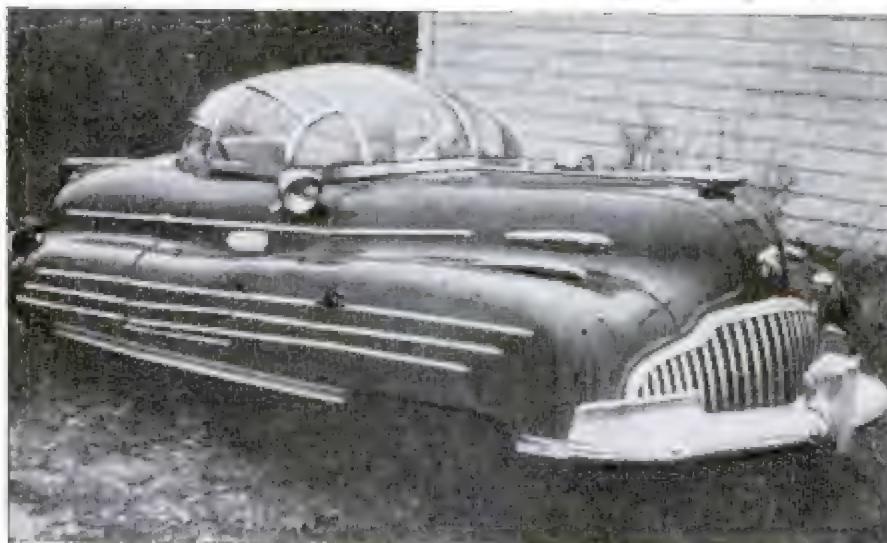


"Double Boiler" Developer

Film processing is streamlined and simplified for the advanced amateur or professional photographer by a new system which eliminates handling film from loading to drying. Equipment consists of a light-tight container and cover, three two-gallon developing tanks and two floating covers, all made of black plastic. A tank is loaded with film in a darkroom and then lowered into one tank after another through the successive steps of developing, washing, fixing and rewashing. The developing and fixing solutions seep upward through a maze of lightproof grids. Washing is com-



pleted in five to 10 minutes and the solutions can remain in the tanks—protected with floating covers—ready for future use.

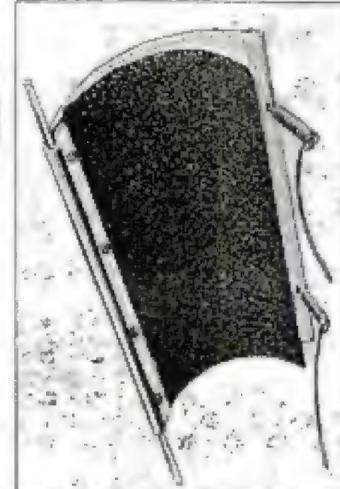
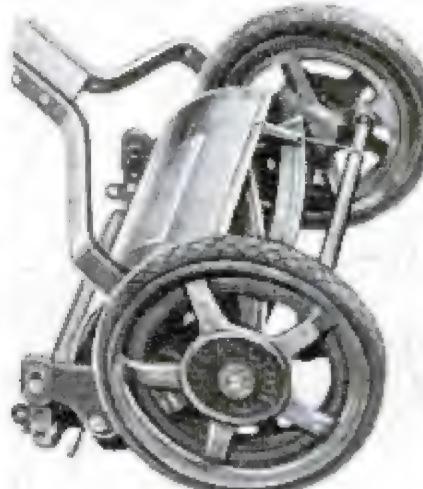


"Bubble" Top Auto

Anticipating that cars of the future will have all-around vision, George Bartell of Detroit built a streamlined automobile with a transparent plastic top similar to an airplane gun turret or "bubble" canopy. Named the "Hollywood Streak," the car is 48 inches high, 60 inches wide and 140 inches long from bumper to bumper. It is powered by a 100-horsepower motor.

Mower Keeps Itself Keen With Simple Sharpener

Grinding wheel principles are applied to a simple lawn mower sharpener invented by Rudolph Schneider and Bernard Marr, Milwaukee machinists. Blades of the mower act as the grinding wheel while the sharpener, a curved piece of metal containing emery cloth on the concave side, remains stationary. A rod at the base of the sharpener fits between the roller and stationary cutting bar of the mower, with the emery side facing the blades. The sharpener curves over the blades and its top is hooked to the mower's connecting bar by two springs which hold



it firmly in place. By pushing the mower 20 to 30 feet, blades whirl against the emery and are ground to a razor's edge.



COLOR WHEELS were fitted over 800,000,000-candle-power Army searchlights to produce spectacular rainbow effects at a celebration in the Los Angeles Coliseum. Forty-two of the huge lights circled the field

PIPE HOLSTER gives protection against stem breakage. Worn over the belt or a suspender button, it will also hold pen, pencil, pliers, ruler or fishhooks. A sanitary plastic cup holds the stem in place



MORE POWER than from other engines of similar displacement is reported developed by this 16-cylinder inverted V-type engine built by Chrysler for the AAF. Liquid cooled, the engine develops 2500 horsepower

NEW TIMER automatically controls "on" and "off" timing when plugged into developing, printing, enlarging or photoengraving equipment. It has eight-inch dial and operates on 110-volt, 60-cycle current



There's Gems in Them Thar Hills!

Amateur '46ers go prospecting for rubies and amethysts they can polish for rings and brooches. Once in a while the gem turns out to be mastodon ivory or the tooth of a prehistoric horse

TAKE a look at that anthill!" The two pros-

pectors bent down and saw, among the litter of small pebbles brought up by the big red ants, a gleaming chunk of what looked like purple glass. Some shrewd deduction, plus ample use of pick, shovel and dynamite, eventually led them to a small fortune in massive, rod-like crystals of gem-quality tourmaline. Amateur prospectors had learned another trick.

The Indians already knew it, for many a fine pyrope garnet has been gathered from Arizona anthills by keen-eyed Navajos. But if you're going to join the army of amateur gem prospectors tramping over U. S. plains and deserts, you'll need to

By Maxwell Reid Grant

learn many of these tricks.

You need to know, for example, that you test a gem for its ability to take a polish by scratching it on a bottle. You must learn how to chip garnets deftly out of their hard matrix rock, how to spot agate-lined "thunder eggs" under their warty outer shell, and how to slice a rock with a "mud saw" or turn a neat facet.

Almost any week end when the weather's good, amateur gem hunters are out combing hills, deserts, lake shores and stream beds in search of material. When luck is good they may bring back garnets half as big as your fist; volcanic bombs, thrown from ancient exploding craters; amethysts in clusters eight or 10 inches long, or hollow,

Amateur gem hunters search desert hills for precious stones on mass prospecting expedition. They traveled 1600 miles



melonlike geodes, lumpy and drab outside but with a fine gem inside.

Believe it or not, gem stones aren't rare—they're plentiful. From coast to coast, our land abounds in rocks that your backyard workshop can polish to a high luster for brooches, pins or rings. When winter comes, gem polishing is a pastime for the long evenings, and blizzards don't stop enthusiasts from swapping specimens by mail.

Every now and then an amateur prospector makes a big strike. Just before the war, genuine emeralds, the first to be found in the United States, were discovered by a man near Rye Patch, Nevada. Another ran into a deposit of diamonds, some as large as a third of a carat, as well as some garnets and sapphires. A woman prospector, digging away on her gem-stone beryl claim, suddenly struck a vein of heavy, black, glossy rock. She sent in a sample for analysis and learned it was pitchblende, mother ore of uranium—then an obscure mineral but now the object of world-wide search as raw material of atomic power!

Amateur mineralogists are rallying once more to club expositions where enthusiasts exhibit their fine stones and learn what's new in prospecting.

If you were to visit one of these meetings, you'd see long tables covered with strange and beautiful rocks. Each is correctly labeled—a point of honor with the dyed-in-the-wool fan. Before your eyes, amateur

collectors open paper envelopes lined with cotton and pour out gleaming sapphires, rubies, opals, amethysts and topazes, ranging from pinhead to bird's-egg size and polished to perfection on homemade equipment. Collectors buy for their home museums and often you can pick up tiny uncut sapphires at a nickel apiece; garnets go three for a quarter, a huge flawless gem of kunzite for \$2500. Many of the rare items money couldn't buy.

In the darkroom next door, chunks of drab rocks are piled high on a table. When the room lights are switched off, these minerals miraculously awake to gleaming radiance of purple, green and gold as they lie bathed in the beams of hidden ultraviolet lamps. These are the magic luminescent rocks, and two of them are rare prizes.

One, a coal-black piece of fluorite, changes to dirty gray under the ultraviolet rays—but in total darkness you can see it gleaming like a dazzling white snowball. Afterward, by its light, you can read your watch, for the mineral phosphoresces like a glowworm.

The other, a fragment of opal on chalcedony, also is a rare specimen. To get it, the prospector spent a whole day climbing a mountain, then a second day lowering himself on a rope from the edge of a cliff, where, suspended in midair, he chipped off bits of the rock with a pick. Under the ultraviolet rays it flares out a brilliant emerald green.

Fossilized footprints in what once was muddy lake bottom, now slab of stone

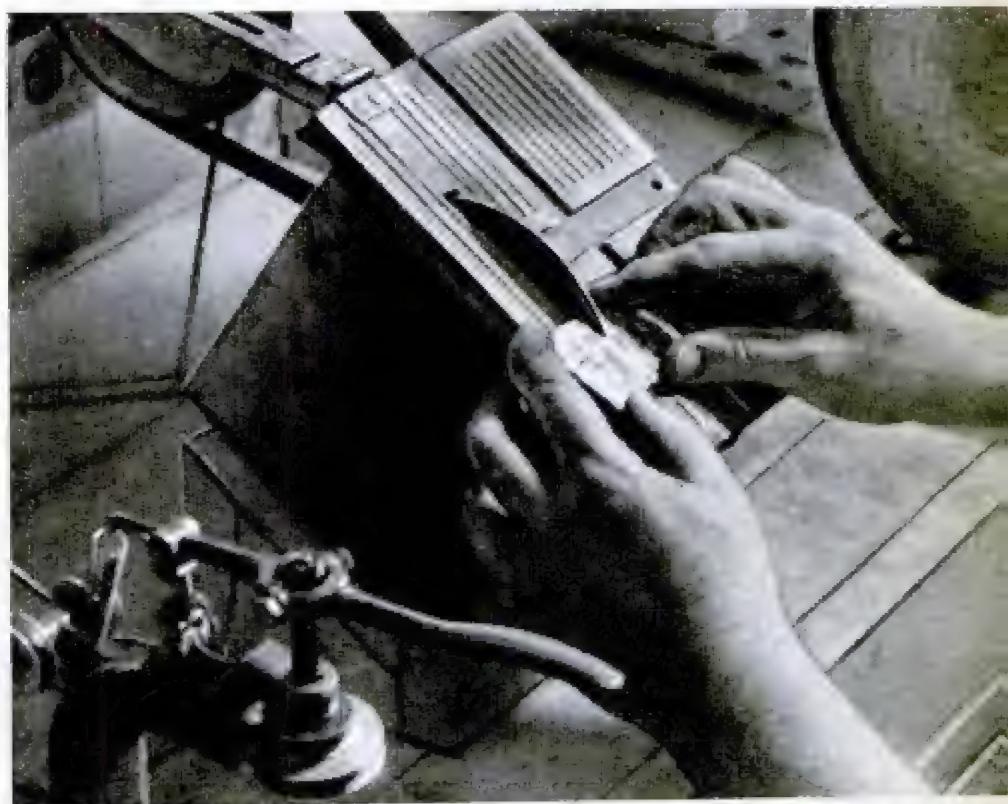
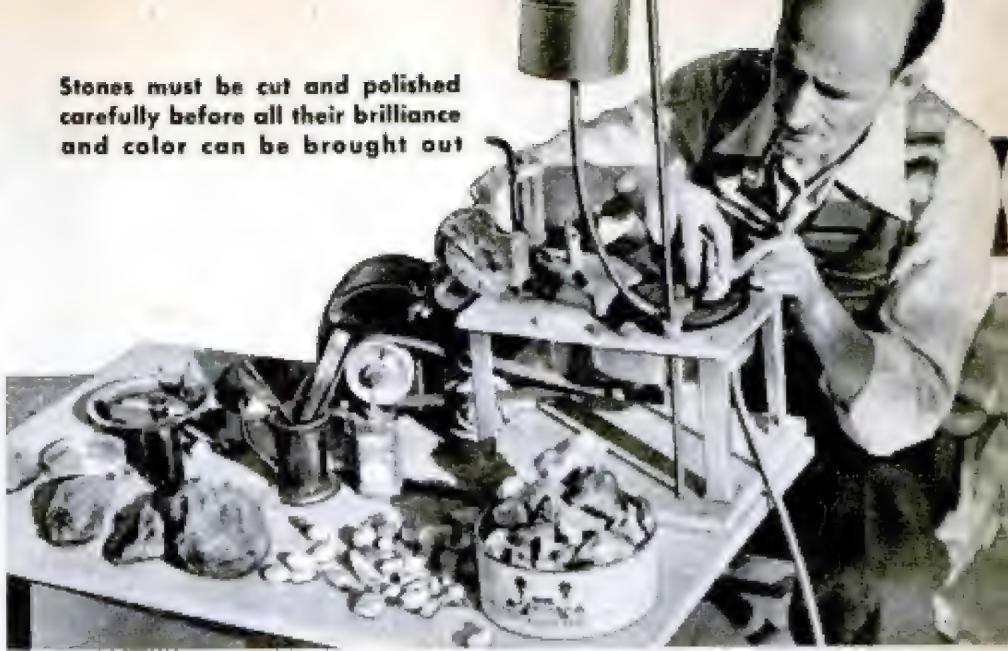


There may be an auction of donated specimens to raise funds for the club's treasury. There's an emerald lying imbedded in a chunk of schist from Europe, a fragment of malachite from Africa, a flashing white zircon imported from Siam.

Another group watches demonstrations of the latest gem-polishing machine. Here's the real secret of the boom in amateur gem prospecting. With a few inexpensive gadgets any one can do his own cutting and polishing at home. The craft is being introduced in city playgrounds and at civic groups and hobby clubs where members chip in to buy their equipment or make their own from junk.

"This hobby pays its own way," says one young prospector. "There's always a steady demand for the more common stones. Any manufacturing jeweler probably will tell you he

Stones must be cut and polished carefully before all their brilliance and color can be brought out



Cutting stone, above, with metal disk "mud saw." Gem prospectors, left, chip garnets from rock matrix in which the precious stones are imbedded. Collection of opals, topazes and amethysts, below. Collectors always use tongs to handle gems





Quartz crystals, above, found by amateur prospector. If the stones will scratch glass they will take a polish. Below, testing a stone on a glass bottle



can use some well-polished stones suitable for costume jewelry. These stones can give you practice and provide money to build up your own collection or add to your equipment."

But the biggest thrills come in actual prospecting, and you'll not have to go far to start. Any lake shore, any stream bed is a likely place to look. Jasper, for instance, abounds in almost every state, and rubies and sapphires, strangely enough, are fairly common.

Never waste time on a stone unless it is hard enough to cut glass, for it won't polish. Carry a small, flat bottle to try rocks on. For quick identification, a mineral handbook is helpful. Judge rocks by their hardness as well as by their "heft." Minerals are rated on a numbered scale ranging from "1" and "2" for those like talc, which can be scratched with the fingernail, to "3," "4"





Gem hunter, above left, explores crevice in rock wall for mineral specimen. Chuckawalla Slim, gem prospector and dealer, right, exhibits a huge geode, a hollow rock lined with amethysts. It is worth about \$300

and "5," that you can mark with a knife, while "6" is as hard as the knifeblade itself, and only a steel file will scratch quartz, "7." The diamond tops the list at "10." Color is another guide, but don't depend on simply looking at the rock—rub it on a piece of unglazed floor tile. It will leave a streak showing its true natural color.

Don't pass up the fossils, for fossil pine cones, corals and bones of prehistoric animals are gems in their own right. One amateur discovered a deposit of agatized dinosaur bones, many of them lined with crystals gleaming like diamonds. Another worked fragments of mastodon bones into handsome "ivory" bracelets, dress ornaments and cigarette holders whose unusual nature gave them high market value. Ancient whalebone sometimes looks like blue

chalcedony etched with the delicate pattern of the bone structure.

Recently a California amateur found some "gems" which he cut in sections and polished to a beautiful lustre, only to learn they were teeth—from the three-toed horse that once roamed the Mojave Desert in prehistoric eras!

Where you find one amateur prospector, you're likely to find a dozen, for mass prospecting is now the fashion. Groups of week-enders toss pick and geologist's hammer into their cars and head for the open country. A 60-car caravan swung around a 1600-mile loop on an eight-day prospecting tour. Most of the tour was on paved highways but they came back with car springs groaning under the weight of specimens.

(Continued to page 242)

Barbecue Outfit Folds Into Suitcase

Carried like a suitcase, a steel barbecue outfit can be set up in your back yard in a few seconds—ready to cook an entire meal. Weighing only 20 pounds, the unit is encased in a steel container 12 inches wide, 9 inches deep and 20 inches long. The cooking area on the grill is 10 inches wide and 17 inches long. The hand-carried model includes an ash tray with lighter box, two draft control units and solid steel legs. A special fuel which leaves no soot is supplied with the portable barbecue for use in the lighting unit. Another feature is a "stay put" skewer which can be set in any position to hold the barbecue meat to insure even cooking. The plate warmer provides ample room for chinaware to warm during the cooking period and the cutting board offers a wide surface for carving and serving the barbecue.

Concrete made with coral and salt water solved a wartime building problem in Bermuda.



Photos Printed on Wood, Cloth, Leather or Plastics With Sensitized Coating

Photographers will soon be able to print their pictures on metal, wood, cloth, leather, plastics or any other material with a suitable surface, freeing themselves of the

limitations of commercial printing papers. The process is based on a thin, jellylike emulsion, which becomes a liquid when heated to 125 degrees and can be applied to many materials with a brush, soft sponge or rag. Application of the emulsion and printing of the sensitized material, either by contact printing or enlargement, must be done in a darkroom under ruby lights. The technique was developed by the Glenn L. Martin Company for the projection of drawings on work surfaces. Many applications, for professionals as well as amateurs, are foreseen. Photographs can be printed in almost indestructible form; outdoor signs can be made with a lacquered or varnished finish; photomontages may be made more easily, and greeting cards, jewelry, leather goods and other personal effects can be decorated photographically.



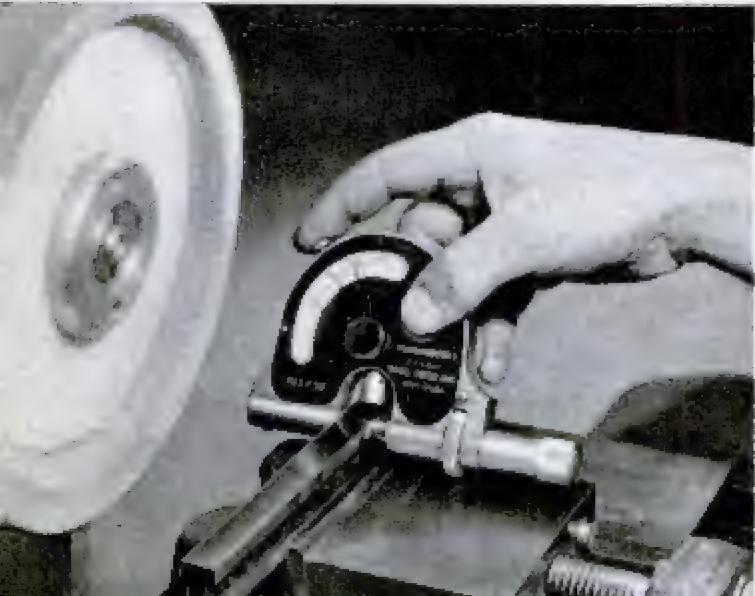


COMPUTING MACHINE invented by Sgt. James T. Patterson figures years, months and days of service to aid soldiers in totaling up their "points" for discharge



THREE KINDS OF POWER, electricity, compressed air or a flexible shaft, will drive a handy tool for sawing and filing that will reach into awkward corners

HANDY SNAP GAUGE with dial covers measurements up to three fourths inch and replaces several solid ones that were previously used in covering this range

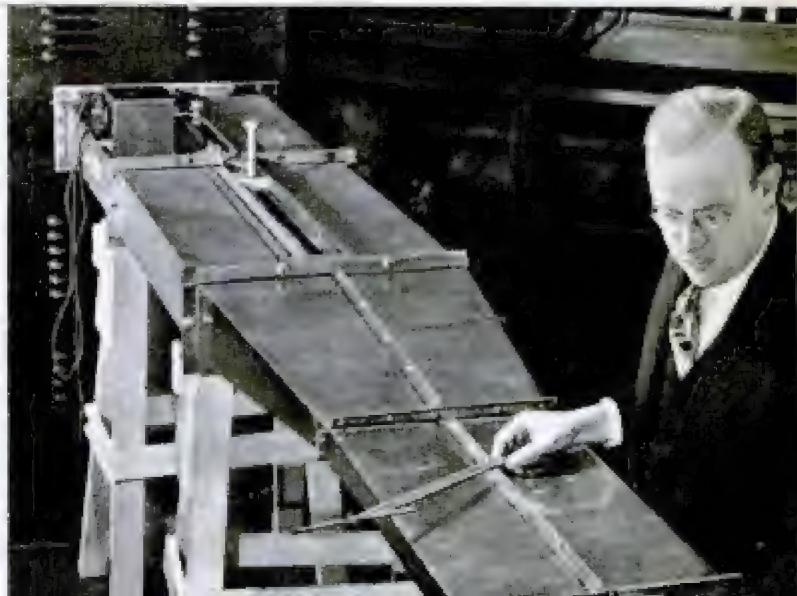


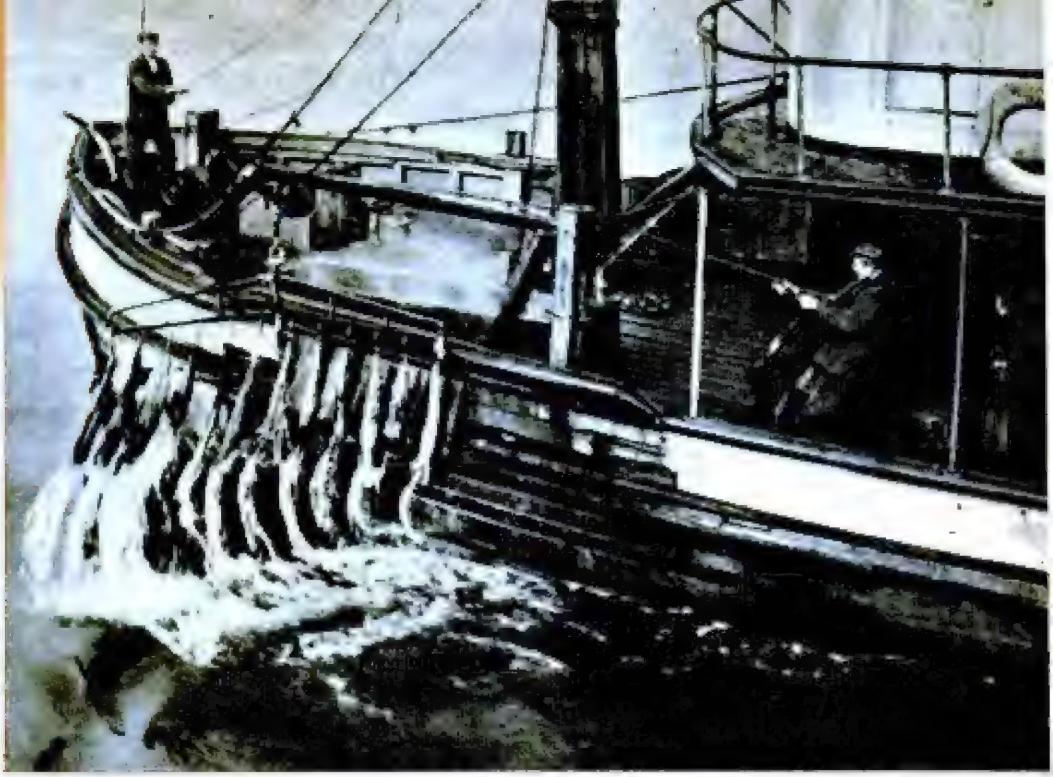
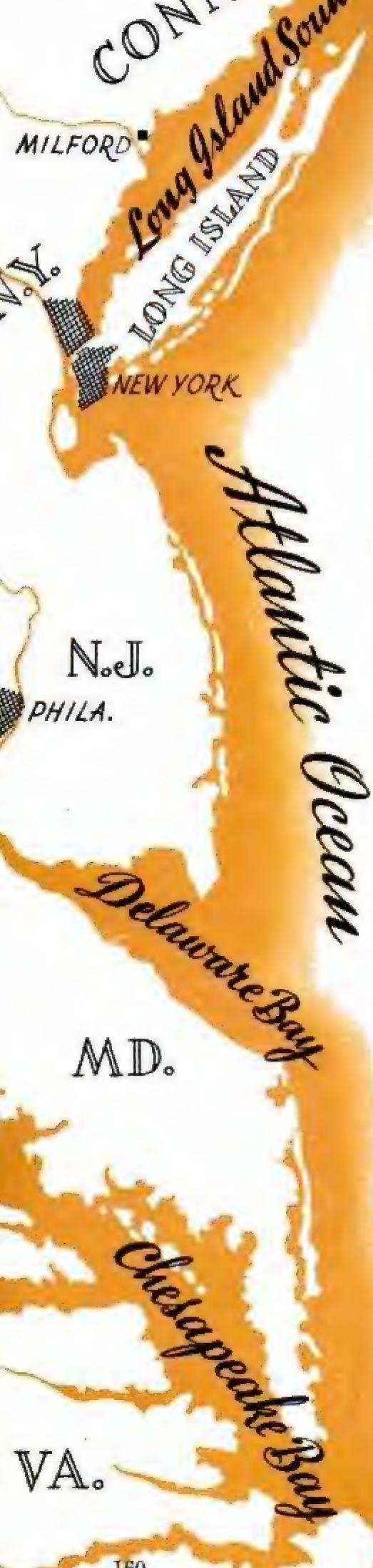
FISHING FROM A JEEP is a new pastime in Florida. A sportsman converted one of the vehicles into a small boat complete with splashboards to keep out water



A COMMUNITY "UMBRELLA" for a proposed Chicago amphitheater will be formed by two roof sections that will roll together to cover 10,000 people when it rains

EXPERIMENTAL "BLOWTORCH" resembling a xylophone beams radio waves instead of concentrated flame to heat any object uniformly, regardless of shape





Starfish cling to huge rope mops as they are hauled aboard an oyster boat

Mopping Up

Oystermen are waging an unceasing war on the shallow ocean floor just off our coasts with boiling water, vacuum cleaners, quicklime and mops as weapons. The enemy, which so far has not succumbed to relentless attack, is the starfish, whose depredations against the nation's oyster beds cause losses of millions of dollars each year.

In Long Island Sound alone, starfish consume several hundred thousand bushels of oysters. Beds in New York, Rhode Island and Massachusetts suffer heavily. In addition, the loss of spat, or infant oysters, upon which even young starfish feed, is beyond calculation.

To safeguard the supply of oysters, the industry, with assistance from the Fish and Wildlife Service of the Interior Department, fights the predatory starfish continuously. In attacking oysters, which with clams and mussels supply most of its food, the starfish first must open them. This it does by fixing the suckers of its arms to the shells and patiently pulling them apart. This may appear difficult to a person who has tried to open live oysters with a knife or other implement, but the starfish's secret is persistence. The oyster cannot resist a long, steady pull and it is this kind of pressure that the starfish exerts. Once inside the shell, the starfish consumes the oyster by wrapping its stomach around the meat. A single medium-size starfish will eat as many as five one-year-old oysters a day.

Oyster dredges often pull in almost as many starfish as oysters. When this happens the oysters are saved and the starfish killed in large wooden vats of boiling water. In other cases, boats are sent out to clean the oyster beds with starfish mops. These consist of an iron bar up to 10 feet long to which are chained 12 to 16 bundles of rope yarn.

Each starfish boat has two mops, one on each side. These are lowered into the water and dragged along the bottom. The starfish cling to the mops by the thousands. When hauled to



Mops carry the starfish to death in vats of boiling water



This is the enemy in oyster bed battle

Starfish*

the surface, the mops and the starfish are dipped into boiling water. Dredging of seaweed also is helpful in ridding the oyster beds of the pests because young starfish cling to the seaweed.

A suction dredge, which operates like a vacuum cleaner, removes more of the encroaching starfish. The dredge draws up loose material from the beds through a flexible pipe and deposits it in a rotating drum where it is screened into a sediment tank. Oysters caught in the tank are returned to the beds while the starfish are removed and destroyed.

Sometimes it appears to the oystermen that they are losing the battle to the starfish, whose numbers never seem to lessen. But new techniques for eradicating the pests have been devised by the Oyster Institute and by the Fish and Wildlife Service. At the government laboratory at Milford, Conn., Dr. V. L. Loosanoff declared chemical warfare and spread quicklime over starfish infested beds. While the caustic action of the lime has no effect on the oysters, it burns the covering membranes of the starfish and causes their eventual death.

The lime is distributed uniformly on the bottom by a unique lime spreader.

(Continued to page 238)



Oyster Institute of North America photo
Dead starfish, above, piled on deck of an oyster boat

Quicklime spreader is unique chemical warfare weapon



Chrysler Features Safety Rim Wheel

Special wheels on the 1946 Chrysler car reduce the hazards of blowouts by gripping the tires when they are deflating so they will not come off the rim. The size of the wheels has been reduced from 16 to 15 inches. Plated aluminum pistons have replaced the cast-iron pistons installed in the 1942 models. Front and rear bumpers have been extended around the sides of the fenders for greater protection. Bumper back bars and guards are heavier and stronger. Six models of the car are powered by six-cylinder engines and



three heavier models by eight cylinders. Twenty-six different body styles of the models are offered in 13 standard colors.

Flagpole Washing Machine Operated by Steeplejacks on Ground



Steeplejacks stay on the ground when they use a device improvised for washing flagpoles of the nation's capital. The flagpole "washer" consists of a double ring of pipes that partially encircle the pole. The top ring is perforated with small holes. The lower ring has a sponge rubber facing. A long rubber hose attached to the rings is connected to a truck on the ground. The rings are drawn up and down the pole with the flag lines, which ordinarily raise the flag. Steam, boiling water and cleaning powder are forced up the rubber hose and through the holes in the top ring. The dirt is brushed down the pole by the sponge. The device is used by the National Capital Parks Bureau.

Skeeters in Color

U. S. Public Health Service scientists spray mosquitoes with blue, red and green fluorescent compounds to identify the insects, trace their flights at night and acquire more knowledge to fight them.



Baldwin Locomotive Works

Most powerful single-unit Diesel engine built by Baldwin Locomotive Works for Seaboard Air Line Railway develops 3000 horsepower

Model (right) of 101-foot electric locomotive which General Electric Company is building for Great Northern Railway. Largest single-cab electric locomotive in the world, it will generate 5000 horsepower

Great Northern's new Diesel service shop at Havre, Mont., has a drop table (lower left) and track pit 205 feet long (right). Design was adapted from Italian railway





PART 3

RADAR Cues the Navy Fighters

By Lieut. Comdr. James S. Hunter, USNR
and Lieut. (j.g.) Max Hodge, USNR

THE stories of night fighter direction are endless. One, perhaps, will suffice to illustrate its importance to the Fleet.

In mid-January it was decided by the high command that Admiral Halsey's Fleet would make a sweep into the China Sea to ferret out shipping and aircraft and protect the landings at Lingayen Gulf on Luzon. Geographically, the China Sea, as map gazers know, is a gray and turbulent body of water whose approaches from the Western Pacific are through narrow channels to the south between Borneo and the lower

Philippines, and to the north between Formosa and northern Luzon. Both channels were heavily patrolled by the Japanese. With the situation in the China Sea highly uncertain, it was imperative that all precautions be taken to avoid discovery on the initial entrance to the China Sea which, command decided, would be through Balintang Channel—a narrow strip of water just north of Aparri on Luzon and just south of the Jap stronghold of Formosa.

The task force entered the channel at dusk. During the night, CIC watch officers



Radar antenna projecting from lower surface of wing helped guide Avenger back to carrier

noted on their radar screens the white outlines of the southern tip of Formosa slide past, tensely waiting for the telltale trace of Jap snoopers. The hours ticked by. The radar screens, except for the occasional thin trace of cloud, remained blank. Then at 0555, with dawn scarcely more than a premonition on the horizon, the first Jap appeared 60-odd miles to the south. Immediately his course was noted—zero-one-zero, a straight line toward the strong Jap bases on southern Formosa. Immediately

the task group fighter director officer went into action and the raid was assigned to the USS Independence whose night fighters were airborne.

In the CIC of the Independence the night fighter director, Lieutenant Commander Eliot Thompson of Monroe, Louisiana, set to work. It was important—all important—not to miss! Within minutes the night fighter pilot was on his way. On the bridges of the carriers and battle wagons, and most particularly in the flag plot of Admiral Halsey's flagship, command stood by, listening to the reports of the interception coming up from their CICs.

Within short minutes—at 0620—another bogey popped up to the south and 15 minutes later still another, arrowing northward from Luzon. Dawn crept over the fantails of the task group—first a lightening in the grayness, then sudden bursts of incredible orange. But no one bothered to admire it. In a few swift minutes, perhaps, the whole carefully laid strike into the heart of the Jap's inner empire might be threatened.

Above the crackle of static in the plane-to-ship radio circuits the orders went out to the planes:

"Hello, Two, Buster . . . Hello, One. Vector starboard zero-two-zero . . ."

Finally—and it seemed to the waiting ships a long finally—the reports came in: at 0630 splash one; at 0647 splash another; at 0706 splash number three—a clean sweep!

Melodramatic? Perhaps . . . but wars are fought, as all fighting men know, in an atmosphere compounded of melodrama and long boredom. At any rate, fighter direction rang up another score to its credit on that early morning of January 10 and the Fleet went in undisturbed to unleash a fury of strikes that sank a still-standing record of Jap shipping.

Up to now, fighter directors have been shown as men who direct planes away from the ship or island base to intercept enemy raids. But there is another function that FDOs perform—a function that, to our own Navy pilots, may well be considered the most important of all. This is the fighter director's use of radar as a device for homing lost planes.

In the vast reaches of the Pacific, rain squalls move like ceaseless shadows across the seas. Particularly in areas off the land masses in which carriers habitually operated, weather is a constant factor and a constant menace. From the deck of a battleship or a carrier, another carrier may loom up large. But from 10,000 feet up in the air, from 10 miles away on a bad day, a task force is just a collection of smallish dark shapes on the face of a monotonous gray waste of water to the returning pilot.



Silhouette of USS Independence, left, and radar scope photo of Nantucket Island, with land white, water black

Under such circumstances, pilots not infrequently get lost despite the fact that they have homing devices and have carefully worked out their navigation. When this happens, radar steps in. If the pilot is in radio touch with his parent ship, he calls in, giving his approximate position. The CIC fighter director or watch officer notes whether he has a plane in that vicinity. If he does not have planes in that vicinity, but does have several blobs of light that might be the lost plane, he may choose to locate the plane by means of a series of "steers." It is a simple enough process. By giving the pilot several "vectors", first north, then west, then south, then east, for instance, the CIC officer can check on the screen or scope to see which blob of light seems to be flying in this "square" formation. By determining which contact is the

lost plane, he can easily give that particular plane a steer to the base. Another method that is used often in the Fleet is to direct the pilot to flash a signal on the IFF gear in his plane which shows a characteristic response on the ship's radars.

The number of pilots who owe their lives—the number who have had to go in the drink and whose position has been noted by radar operators for a subsequent pickup by a float plane or rescue destroyer—runs into many thousands. What this locational device now can mean in peacetime aviation is incalculable.

How important a role radar has played as a lifesaving device perhaps can best be illustrated in another untold tale of the crucial battle of the Marianas. Newspaper readers with a long memory may recall that shortly after the "Turkey Shoot", Task



RADAR "EYES" OF THE FLEET



Radar operator peers into scope as he "peaks the echo" to determine distance and range of his target.



Busiest man aboard a night flying Catalina is the radar operator as he "tunes in" various instruments.



Compare this actual chart of Nantucket Island with Army Air Forces radar scope photo on opposite page

Force 58 was able to locate the bulk of the Japanese Fleet fleeing with its train toward the protection of the home islands after the disastrous raids of June 19. What readers do not know is that the verified contact with the Japanese Fleet came late in the afternoon and that the main body of the enemy force was some hundreds of miles to the west of our carrier force, at the extreme range of our torpedo and bombing planes. A decision was called for. Should Task Force 58 run west through the night, running the risk of losing the Japs, or should the attack be launched immediately? If launched, simple arithmetic indicated that the returning strike planes very well might not be back at the recovery point until well after dark and because of the range when they did get back both

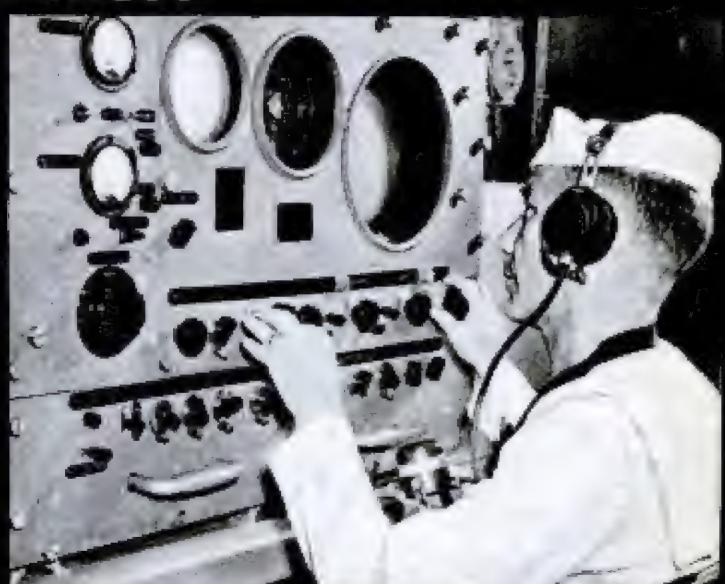


Radar information is entered on transparent vertical chart. More data is being marked on back of chart

PENETRATE FOG AND DARKNESS



Battle stations for this radar team are in the Combat Information Center as carrier planes chase for



PPI at right shows objects picked up; beam rises in A-scope at left to a peak when the echo comes back



Catapulted by JATO (Jet Assisted Takeoff), Avenger wings its way from a carrier deck out over the Pacific



Communications experts on amphibious force flagship keep in touch with all other ships of assault armada. Below, sandbags protect radar station on Pacific Isle



bombers and torpedo planes probably would be very low on gas.

Every carrier man knew what the factors were. Landing planes at night is a tricky business at best and landing planes low on gas, operated by pilots who were essentially day flyers, was fraught with danger not only to the pilots but to the ships themselves.

Because such decisions must be made and risks are part of the tactics of warfare, command decided to launch immediately. It was a chance, yes, but for many months our whole aim had been to establish contact with and destroy the Japanese Fleet. If we missed it . . .

What airmen accomplished in the attack now is safely niched in history as the Battle of the Philippine Sea. In the CICs of the ships of TF 58, officers and men listened to the faint, far ghost voices reporting the death of the Jap carriers—one exploding in a mile-high flower of dark smoke, another down at the bow and dead in the water, cruisers viewed from circling planes, like toy ships on the bomb torn face of the sea, turning in wide, crazy circles, first of evasion and then out of control. It didn't take long.

Because the attack took place out of radar's range, the returning planes were not picked up at once. When they did begin to appear on the screens—100, 125 miles away—the reports of the torpedoes and bombers began coming in:

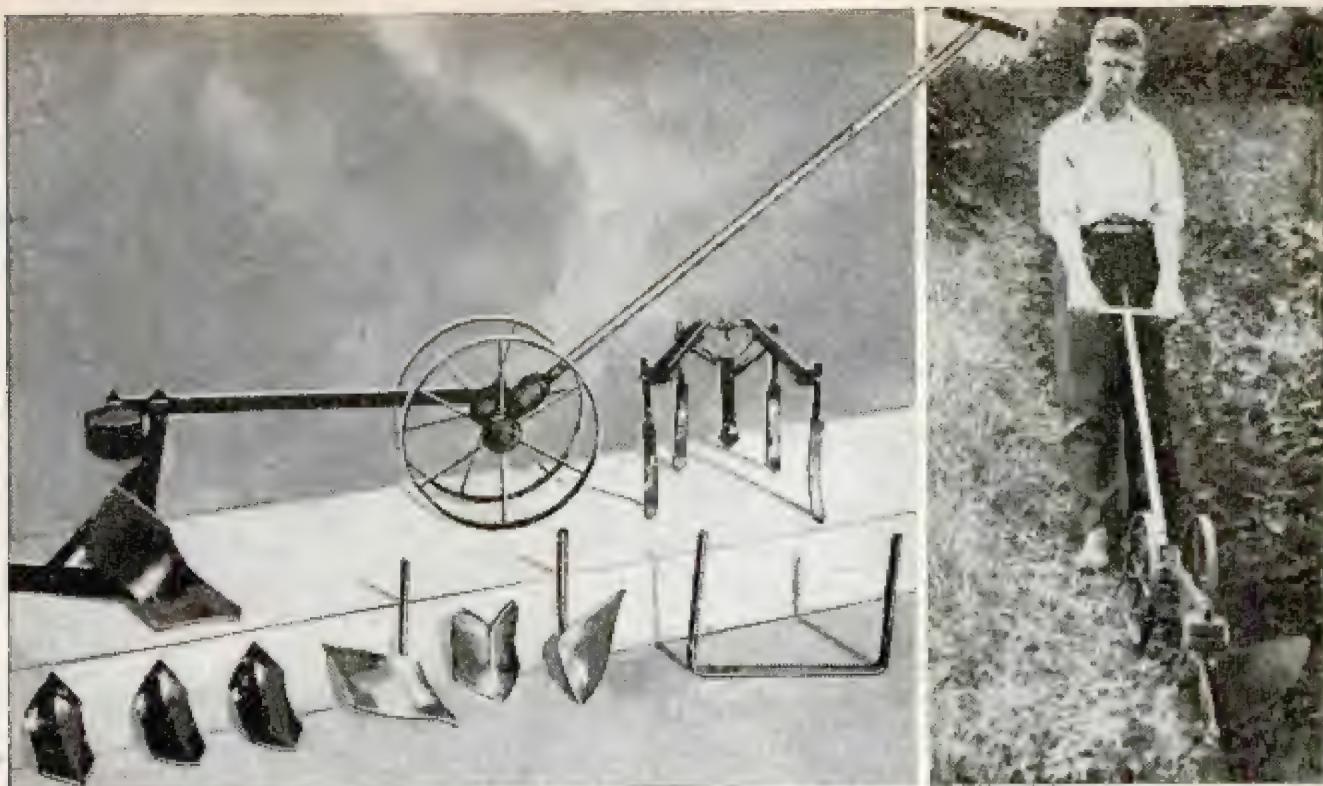
" . . . estimated ETA 2030, but I am low on gas . . . estimated ETA 2045, fuel down to 40 . . . can't make it, out of gas . . . "

By nightfall, short minutes later, the reports began to take on a more somber note, and on the plotting screens of the CICs the Emergency IFF symbol began to show up. One by one, at distances varying from 30 to 75 miles, the torpedoes and bombers began dropping into the sea. Those who got back—mostly the fleet F6Fs—began coming aboard in one of the most spectacular and harrowing nights of the carrier war. The blackout went overboard, despite the nearness of the enemy. Carriers turned on their lights, flung searchlights into the air. Some even lined their flight decks with strings of battle lamps in an all-out effort to get the planes back aboard. Some planes crashed; others skidded to the barriers, teetering crazily against the wires while flight deck crews fought to clear them. By the twin miracles of effort and that matchless skill which took the Navy's carriers from Pearl Harbor west to Honshu, the vast majority of those who got back to the carriers landed safely aboard.

Meantime, in the CICs of the carriers—who, as the control towers of the Fleet, also

(Continued to page 238)

Small Gardens Are Turned Quickly With Pull-Type Plow



Gardens which are too small for a plow drawn by a horse or tractor can be turned over quickly with a pull-type hand plow. With this plow a gardener can work 10 times faster than with a spade. By pulling the plow instead of pushing it the operator uses the weight of his body to furnish the power. Because he works in front of the

plow he does not trample ground that has already been turned. Attachments include hillers, markers, shallow cultivating sweeps and a guide handle that permits two-man operation. An adjustable five-tooth cultivator works rows only a foot apart. The plow is intended only for ground that has been previously worked.

Reconversion Bulletin — From Solar Still to Beach Ball

Reconversion is no problem for the manufacturer of solar stills, war-born devices that made drinking water from salt water for men afloat on rafts. The stills, made of "Vinylite" plastic of various thicknesses electronically sealed together, are two feet in diameter. They utilize sun rays as heat to remove salt from the water. The same

patterns and dies that were used in making the stills are now producing beach balls of comparable size and made of the same material. Despite their light weight, only a quarter of a pound, the balls are strong enough to support a 250-pound man. Semi-deflated, they can be used as "rafts" or water wings for children.



Designs



LOOK around your home. Study the appearance of your radio, refrigerator, bathroom scale or even that tube of toothpaste in the medicine cabinet.

Maybe they look O.K. to you, but not to an army of engineers, research experts, artists, sculptors, draftsmen and model makers who are busy right now figuring out ways

By John R. Kinsey

to make those products—and thousands of other things—

look better, work better and sell better.

"Nothing made by man is perfect and, besides, a competitor may come out with some improvement"—that seems to be the philosophy of the industrial designer who is either a combination of these craftsmen or an employer of their services.



for BETTER LIVING

Pictured on opposite page, model of modern kitchen designed by Jean O. Reinecke has refrigerator drawers (one open) and a built-in electric range (under clock). Don Hadley (above), designer for Westinghouse Electric Corp., measures model of streamlined steam turbine

Today, industrial designers are working harder and faster than ever before. Employed by big and little manufacturers anxious to meet the pent-up demand for automobiles, household appliances and other articles, designers literally are shaping the things to come.

To correct a common misconception, it should be stated here that an industrial designer is not just someone who draws pretty pictures of sleek streamlined automobiles, airplanes and locomotives.

Some people describe industrial designers as artist-engineers. It is obvious that designers sought by successful manufacturers must be practical men whose creations, although representing improvement, avoid startling the public.

The automobile industry had a notable experience with a too-advanced model 12 years ago. One manufacturer introduced a car whose streamlining was years ahead of current models. Customers stayed away in droves. Yet most cars today incorporate many of the streamline features of this

trail blazer. To gain consumer acceptance, design changes have to come slowly and gradually—not all in one jump.

Another requirement for industrial designers—if they want to stay in business—is the ability to fashion improved products that don't necessitate too much change in a manufacturer's production equipment. It stands to reason that an industrialist can't change his whole factory every time his designer gets an idea for a fancier looking coffee pot, for example.

A third "must"—probably the most important—is that industrial design firms find how to improve the performance of various products. Make them lighter for easier handling. Make them operate more efficiently, more economically. Make them better!

Designers often come up with a suggested appearance change that in itself will make some device more useful. And sometimes it takes years to sell these ideas to a manufacturer, possibly because all his competitors are still following the same old pattern.

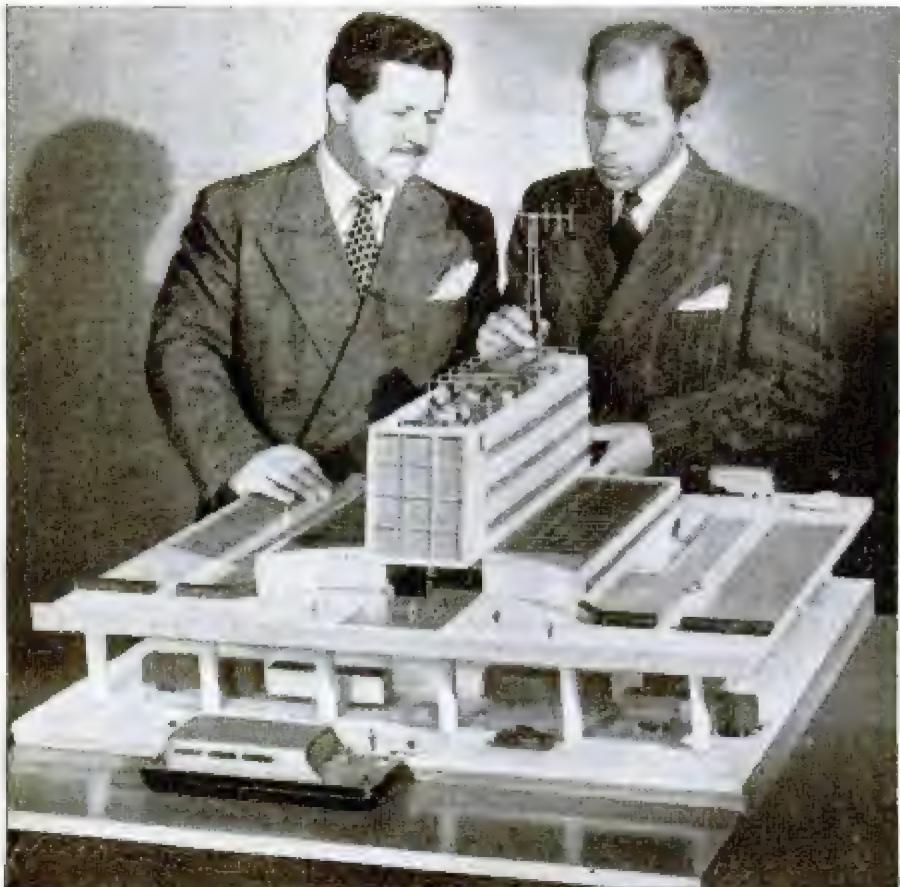


Harper Richards (standing) with clay model of electric train he designed

Here's an example. In the early 1930s most electric refrigerators stood on legs about four inches high. One firm called its model the "broom high" refrigerator and extolled the advantages of housewives being able to sweep under the appliance.

One farsighted designer asked the company's top executives, "Why don't we eliminate the legs and put the refrigerator flat

Model of their proposed "design factory" is examined by James F. Barnes (left) and Jean O. Reinecke, young Chicago designers and engineers



on the floor? It would look more attractive and there would be no need to sweep under it." Years passed before his idea was adopted.

Since the end of the war, industrial designers have been called upon to provide a new service—to find peacetime products to be made by hundreds of small war goods manufacturers who came into being since Pearl Harbor. Not only has it been the designer's job to pick out products that are apt to be in demand, but also to select products whose manufacture fits in with existing machine tools and other production equipment.

Barnes & Reinecke, Chicago industrial design firm, has been a leader in this field. Here are a few of some 300 fast reconversion jobs engineered by James Barnes and Jean Reinecke, both still in their thirties:

During the war, a small manufacturing plant kept busy day and night turning out aluminum parts for bombers. Came the contract cancellation and the humming of production machines stopped abruptly. Barnes and Reinecke were summoned. They made a survey of the plant, studied the production machines, raw material on hand, the skills of the workers. In 48 hours, the two designers and their engineering staff had a rough reconversion blueprint ready for the distraught manufacturer. It included sketches and tooling and production layouts for making a streamlined, step-on-a-pedal garbage pail from leftover bomber segments.

Another small firm went out of the war business and had on hand a large supply of fuselage steel. Production equipment included paint spraying outfits and machines to stamp out metal parts. "Why not start making metal toys for children, perhaps a



streamlined auto racer?" Jean Reinecke asked. The manufacturer said the idea sounded good to him. The designers fashioned the model of a toy auto, and soon it was in production.

The changeover in a third war plant resulted in a switch from aircraft parts to a device which recaps bottles of ginger ale and other carbonated drinks to preserve the "fizz." Most hardware stores are anxious to get these items.

And now for a peek into the future to see what industrial designers are planning for the days that lie ahead. In the first place, most designers agree that the appearance trend for the future will be toward simplicity. From door knobs to locomotives, the accent will be on neat, clean lines, with a definite avoidance of fancy frills. "Things will be better propor-

Wooden model (above) receives final touches from associates of Dave Chapman, Chicago designer, as guide for industrial truck below





Idea for future washing machine (above). From an old-fashioned scale (below) emerged this trim model created by Product Designers, Chicago



Student at Chicago Institute of Design fashioned this chair



tioned," was the way one top-ranking designer put it. To get down to cases, here are some forecasts of possible future trends by two design firms:

W. C. Nichols and Walter F. Nessen, of Product Designers, Chicago, predict increased use of lightweight metals, particularly aluminum and magnesium alloys, in building automobiles.

The versatility of these metals, the designers point out, has been demonstrated by many types of warplanes and other equipment. And the public is anxious to reap the benefits of these lightweight metals in products with reduced weight and improved performance.

"To realize full benefits from the use of light metals," Nichols explains, "products must be engineered from one end to the other. Experience has shown that partial use of light metals does not provide the full benefits that we are seeking."

As an example of what he contends can be done in the automotive field, Nessen has prepared a group of design studies of new automobiles.

"In approaching this assignment," Nichols reports, "we set aside all conventional ideas to develop a design that would incorporate the use of light metals from bumper to bumper and at the same time lend itself to mass production techniques." These lightweight cars would have extremely wide aluminum doors; grilles made from rolled aluminum rather than being stamped or die cast; bumpers made from an aluminum stamping, or cold formed, rolled aluminum alloyed to a structural strength equal to the same gauge thickness

and approximately the same cross-section of steel. The weight saved on the front bumper would permit an extension of a bumper all the way around a car without increasing car weight. Further weight reduction would be achieved by the use of lightweight metals for hoods and wheels.

Turning from automobiles to homes, here is an interesting idea for the kitchen of tomorrow as expressed by Ralph

Kruck, New York designer:

"It wasn't so many years ago that houses were built without storage and clothes closets, without centralized heating. It is only of recent date that dish closets, broom closets and the like were built as part of the kitchen.

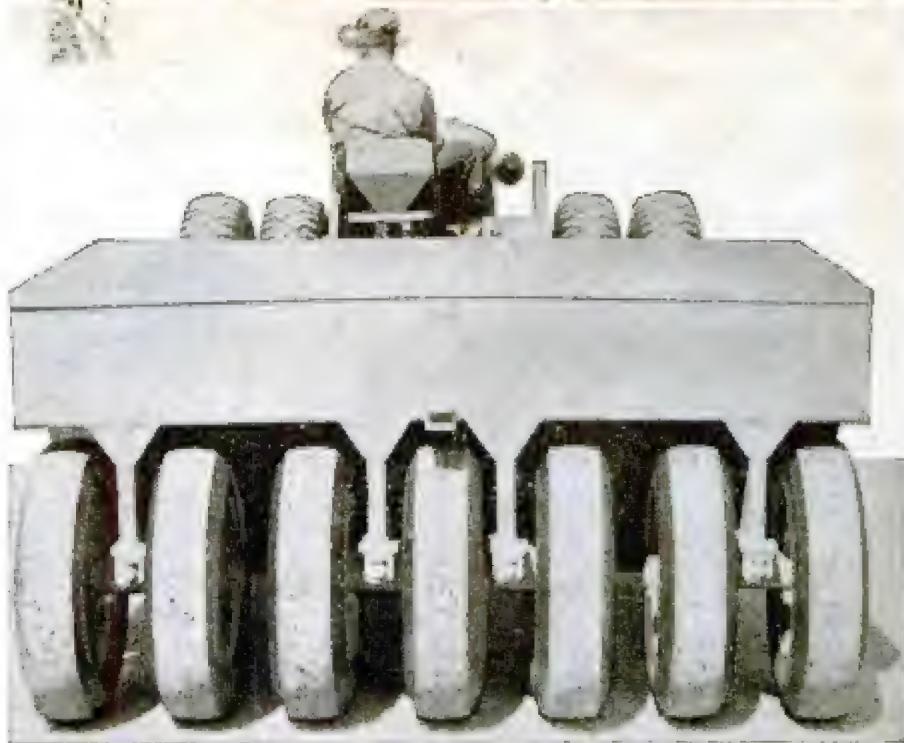
"The kitchens I see in the future will carry this scheme still further. Kitchens will be sold as a whole to home builders. The day will come when housewives would no more think of buying a stove here, a refrigerator there, and a sink from someone else than they would buy an engine from one manufacturer, four wheels from another and a body from a third and expect it to work as well as a properly integrated modern automobile.

"We know that a kitchen designed as an entity will have the same proportionate increase in efficiency that a modern automobile has over a casual assemblage of parts and wheels. It should be understood that this integrated kitchen I am talking about will never be a complete rigid unit. It should never be necessary to tear your home apart in order to insert the square box of a 14 foot by 14 foot standardized kitchen. Cabinet and basic units will naturally be made sufficiently flexible to be set up in rooms of various shapes."

Kruck visualizes the manufacture of appliances which incorporate a refrigerator and a range, or other equipment, in one unit. An electric cooking unit would be so designed that it could slide out of sight after food was cooked.

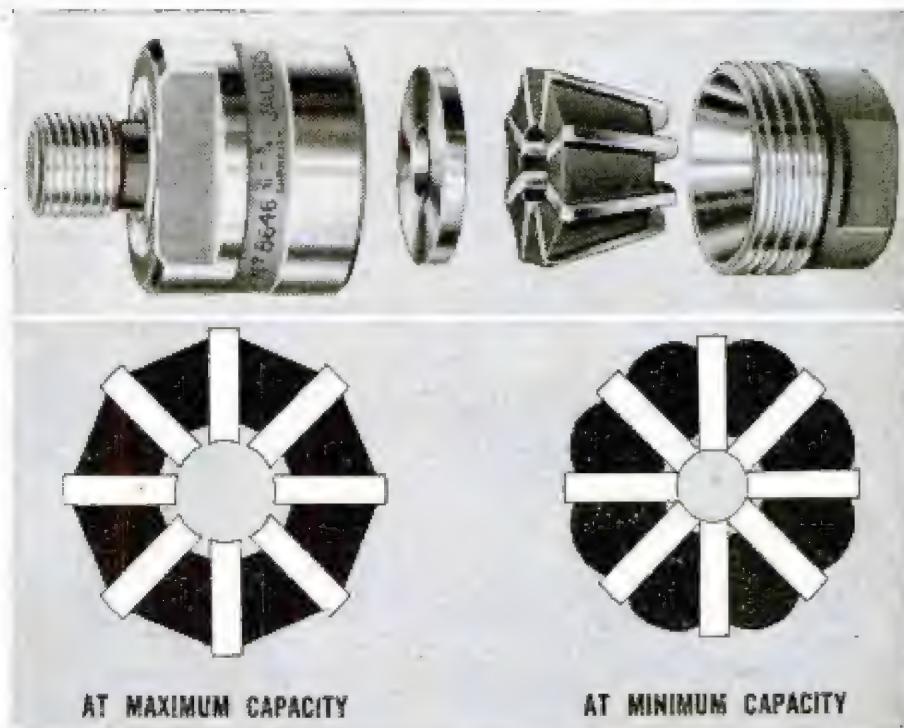
Stick around, folks, a great day is coming!

'Wobble' Roller Packs Earth on Airfield



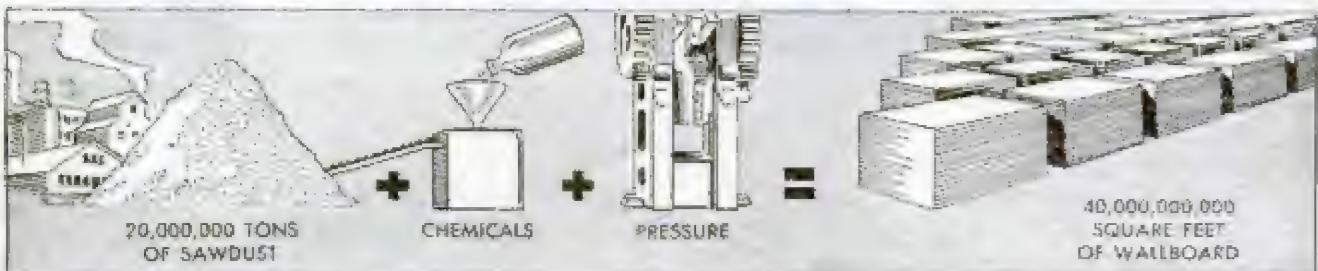
Wobbling from side to side, multiple wheels of a surface roller pack the earth for smooth airfield runways. Each wheel is individually mounted on an off-center hub which causes a one-inch wobble. In this way the wheel makes a wavy line, eliminating ridging. It can be used to pack earth fills, roll crushed rock bases, compact stabilized roads and finish bituminous surfaces.

Rubber Web in Drill Chuck Gives Wider Range



Tough synthetic rubber replaces the steel shank in the inner socket of a heavy duty drill chuck. The rubber passes through anchoring holes in the jaws to form a conical unit tightened by a screw mechanism. When the chuck is loosened the web pushes the jaws apart to release the drill shank. A wider range of drill sizes can be handled with one chuck and the jaws are said to have a powerful grip.

Waste Sawdust Makes Inexpensive Wallboard



Sawdust and a chemical derived from wood waste are mixed by Warren R. Smith as Dr. Donald F. Othmer squeezes the compound in a hand press. The process may salvage 20,000,000 tons of sawdust wasted each year

Forty billion square feet of hard wallboard, enough to construct a million vitally needed houses for America, can be made by a method that utilizes sawdust and other wood waste. The cost of one square foot of the new wallboard would be less than one tenth of one cent. The process was developed by Warren R. Smith, research engineer of Crown Point, N. Y., and Dr. Donald F. Othmer of the Polytechnic Institute of Brooklyn.

Lumber-using industries of the United States waste about 20,000,000 tons of sawdust, fine shavings and chips each year. In some industries 75 percent of the wood is wasted. One ton of this waste, processed by the new method, will yield 2000 square feet of strong, water-resistant wallboard. "Bagasse," the waste material of sugar cane, also can be used.

At present, hard wallboard is made by

breaking new logs into individual fibers. In the new method, sawdust is mixed with an inexpensive chemical, derived from other wood waste, that combines the particles, and the resultant mixture is squeezed in a hydraulic press under relatively low pressures. Sawdust can be conveyed directly from the saw to a mixer where the chemical is added. Pressing requires about 10 minutes. Less than 15 minutes after the waste comes from the saw it is finished board.

Wallboard produced by this method is resistant to termites, rot, moisture, warping, swelling and shrinking. It may be nailed and finished like ordinary wood. Molding it like plastic into any shape required gives it an advantage over present types. One-piece duck boats, doors finished and trimmed, and complete prefabricated walls, floors and ceilings are possible.

The CRAFTSMAN

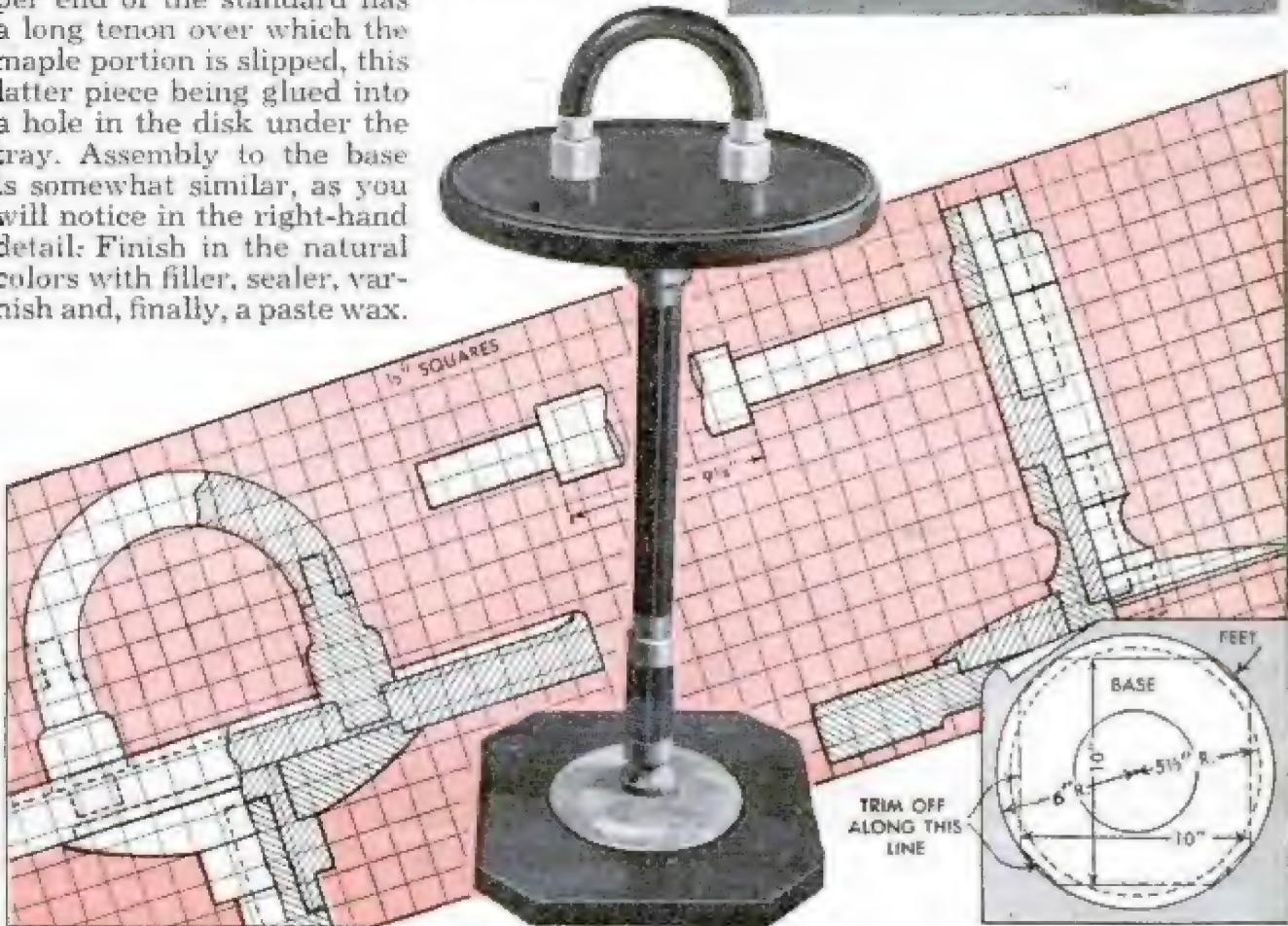


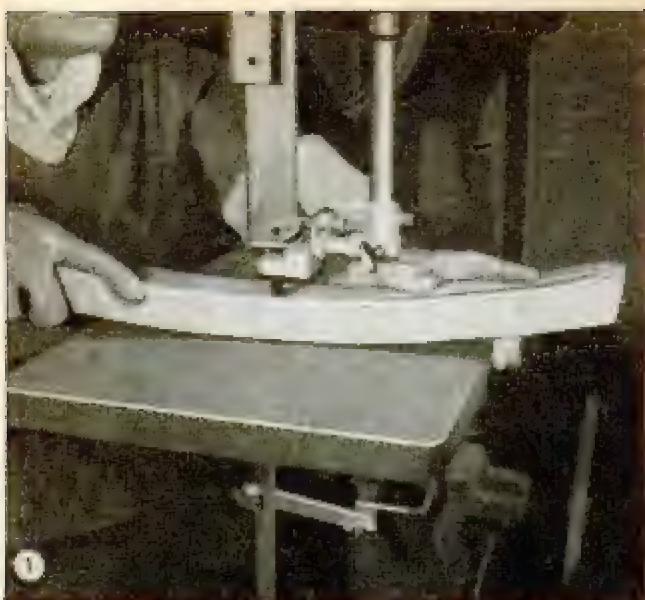
SMOKING STAND *of contrasting woods*

By Benj. Nielsen

THE light color of maple contrasting with the dark color of walnut or mahogany gives this all-wood smoking stand an unusually attractive appearance. The base and top or tray are 12-in. disks turned from 1-in. stock. The top surface of the tray is turned out to form a narrow rim around the edge, and a recess is turned in the underside surface to take a supporting disk of maple, which is set in as in the lower left-hand detail.

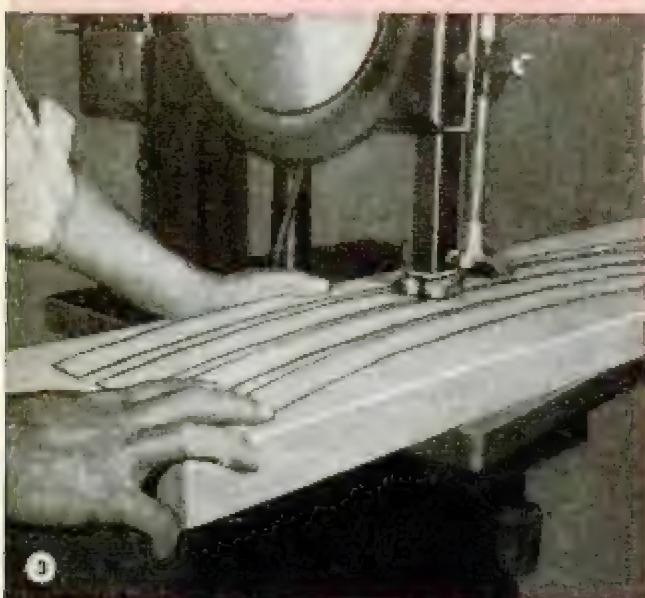
The base also is turned on the underside to form a $\frac{1}{2}$ -in. rim, and the upper surface is recessed for a maple disk similar to the tray. Then the base is trimmed at the edges as indicated in the lower right-hand detail. Trimming removes the rim at the sides, but leaves it at the corners where it serves as feet. The column, or standard, and the handle are built up of maple and walnut assembled as indicated. Note in the left-hand detail that the walnut portion at the upper end of the standard has a long tenon over which the maple portion is slipped, this latter piece being glued into a hole in the disk under the tray. Assembly to the base is somewhat similar, as you will notice in the right-hand detail. Finish in the natural colors with filler, sealer, varnish and, finally, a paste wax.





1

In bandsawing the first and second cuts care should be taken to keep the blade just outside the dimension line. This will allow for finishing to exact size



3

The back posts or legs are rough-sawn from a single piece of solid stock. This piece should be uniform in grain otherwise defects may show in the work



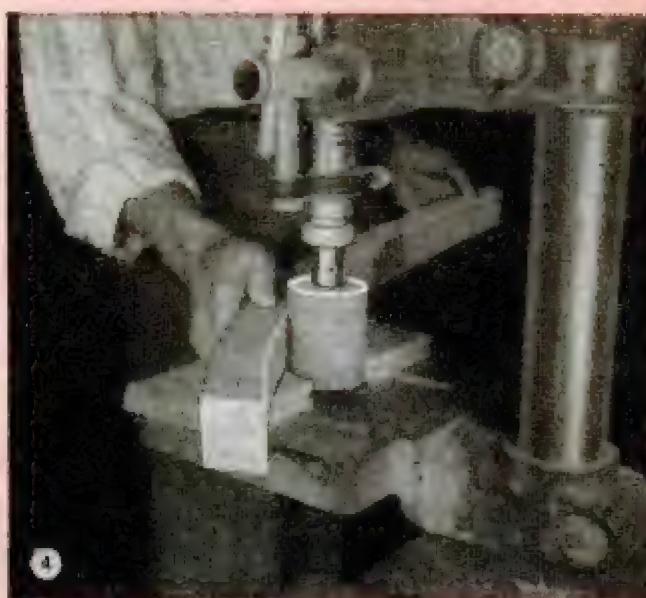
5

Use a sheet-metal or cardboard template to mark the parts for the second bandsaw cuts. Saw cut should be kept outside the line in the waste wood



2

In making mortise-and-tenon joints a close fit assures strength equal to that of the wood itself. Be sure that the square chisel is tight in the holder



4

A small sanding drum mounted in the drill press is just the thing for smoothing the curved surfaces of the rough-sawn legs and rails to finish size



6

The hole forming the curved offset in the back leg is drilled before bandsawing. Select a bit of the same radius as the curve indicated in the details

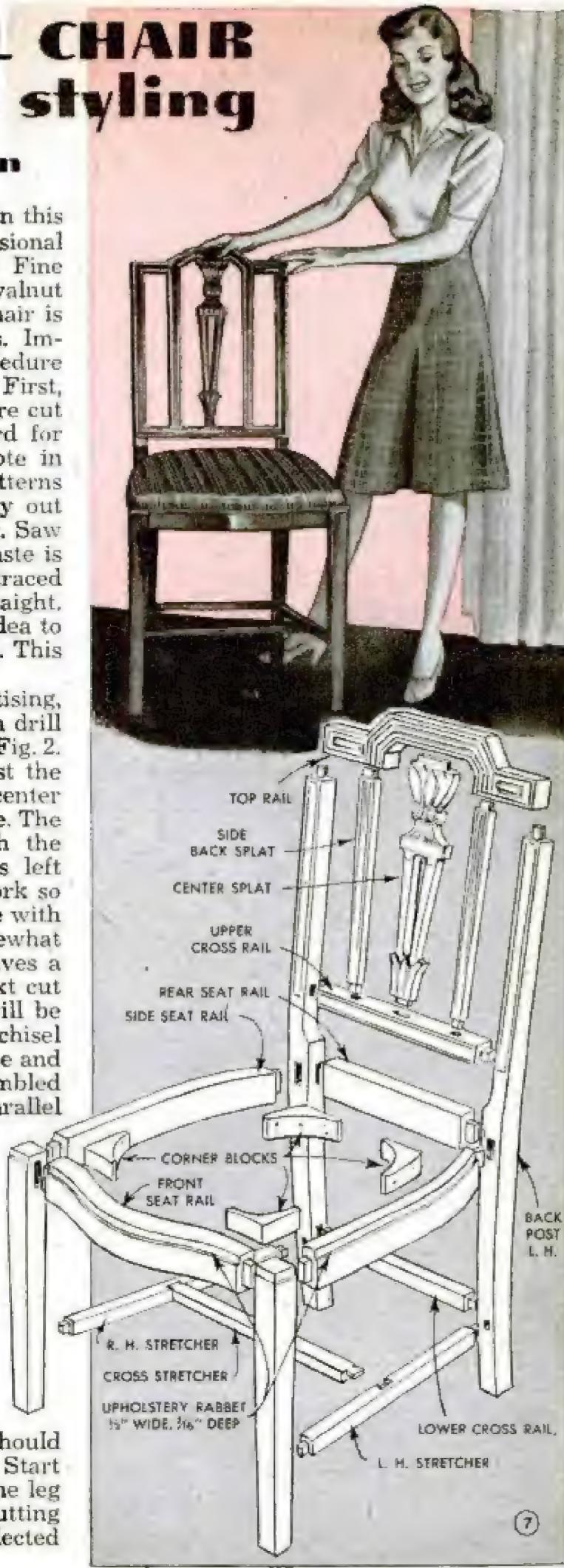
OCCASIONAL CHAIR in Sheraton styling

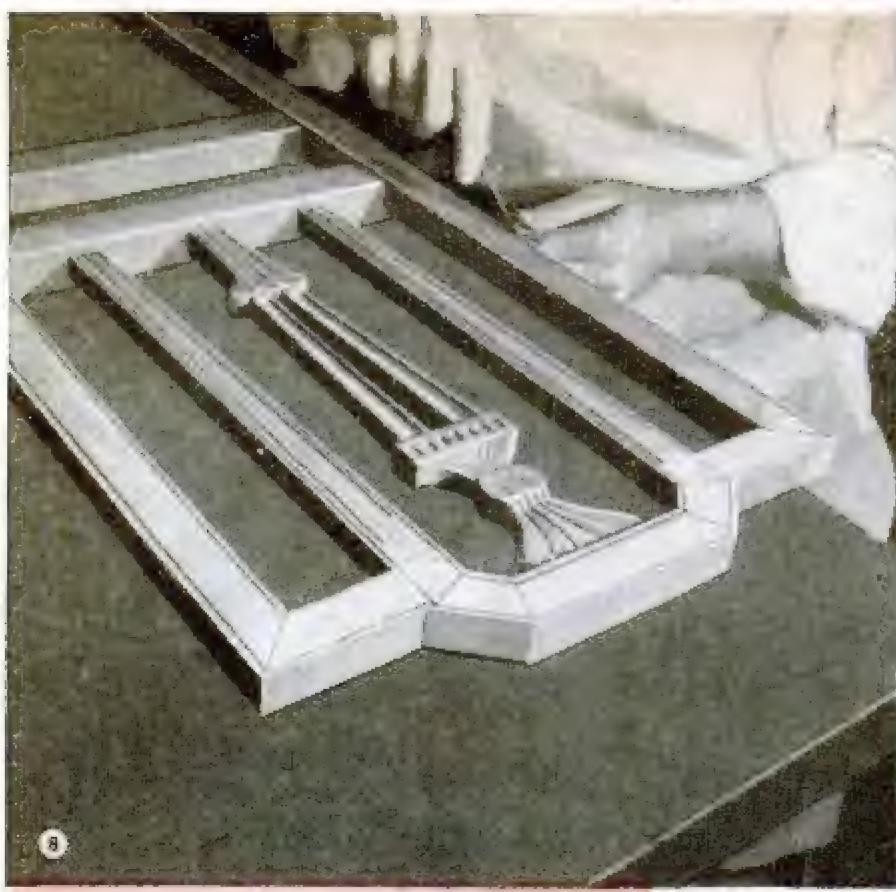
By Henry E. Belden

THERE'S just enough handwork on this fine chair to give it the professional touch of the individual craftsman. Fine cabinet wood such as mahogany or walnut should be used. If more than one chair is desired, simply duplicate the parts. Important steps in the construction procedure are shown in Figs. 1 to 6 inclusive. First, full-size patterns of the back posts are cut from heavy paper or thin cardboard for transferring to the work. You'll note in Fig. 9 that the right and left-hand patterns are duplicates; one will serve to lay out both posts by merely turning it over. Saw cuts "A" are made first, then the waste is tacked back on, the second pattern traced and cut "B" is made. Edge "C" is straight. Before making cut "B" it is a good idea to drill a $\frac{3}{8}$ -in. hole as shown in Fig. 6. This assures a well-rounded notch.

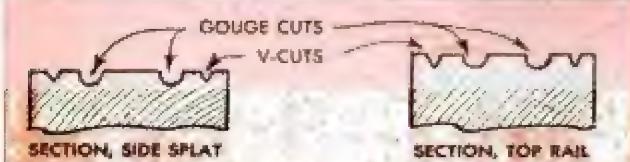
The posts now are ready for mortising, which can be done by hand or with a drill press and mortising attachment as in Fig. 2. Use a $\frac{3}{8}$ -in. hollow chisel and adjust the fence so that the cut will be in the center of the wood and parallel with the edge. The seat-rail mortises also are cut with the $\frac{3}{8}$ -in. hollow chisel. Use the scraps left from bandsawing to block up the work so the face of the mortise will be square with the chisel. The front legs are somewhat longer than the back ones, which gives a slight rake to the back and seat. Next cut the mortises for the stretchers. It will be necessary to block up the work so the chisel will cut at right angles to a center line and parallel with the floor line of the assembled chair. The mortise should be cut parallel with the straight or outside edge of the back post, this edge being held against the fence. The mortise for the lower cross rail is cut with the straight or outside edge of the leg resting directly on the drill-press table so that the chisel is at right angles to this surface.

Each chair requires two side rails made from 2-in. stock in accordance with the pattern in Fig. 9. The tenons on the side rails measure $\frac{3}{8}$ in. wide, $\frac{1}{16}$ in. deep and $1\frac{1}{2}$ in. long. The mortises on the front legs, Fig. 9, should be cut before the legs are tapered. Start each mortise $\frac{1}{4}$ in. from the top of the leg and $3\frac{1}{8}$ in. from the bottom. Before cutting the lower mortise be sure you have selected the correct face of the leg.

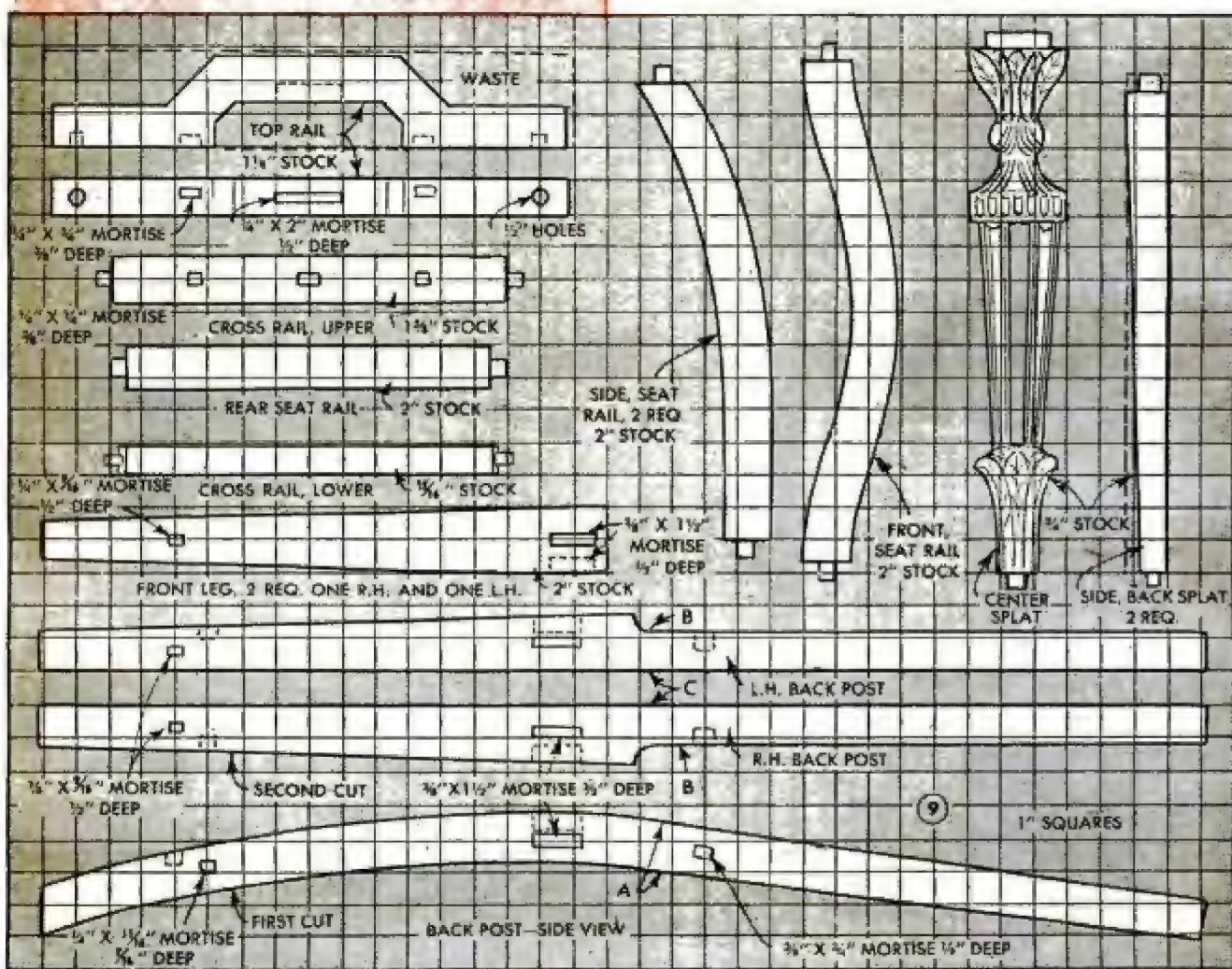




The front legs are tapered on the circular saw by the "notched-stick" method. Take a piece of stock slightly longer than the leg and nail a block near one end. This block should have two step-like notches cut in it. The first one is $\frac{3}{8}$ in. and the second $\frac{3}{4}$ in., both measured from the inside face of the stick. Place the lower end of the untapered leg in the first notch with the stick next to the ripping fence. After the first cut is completed turn the leg completely over so the saw engages the opposite edge and place the lower end of the leg in the second notch. In each instance the fence should be adjusted so that the saw engages the leg at a point $2\frac{1}{8}$ in. below the upper end, as in Fig. 9.



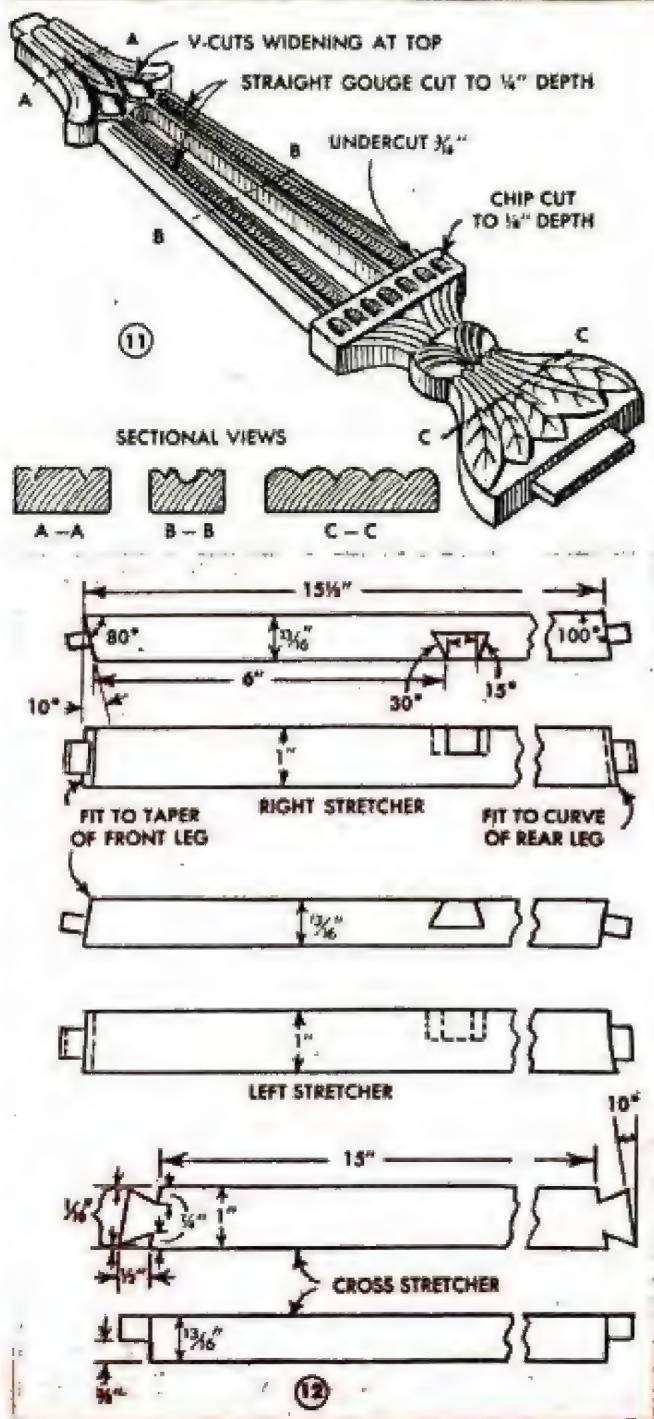
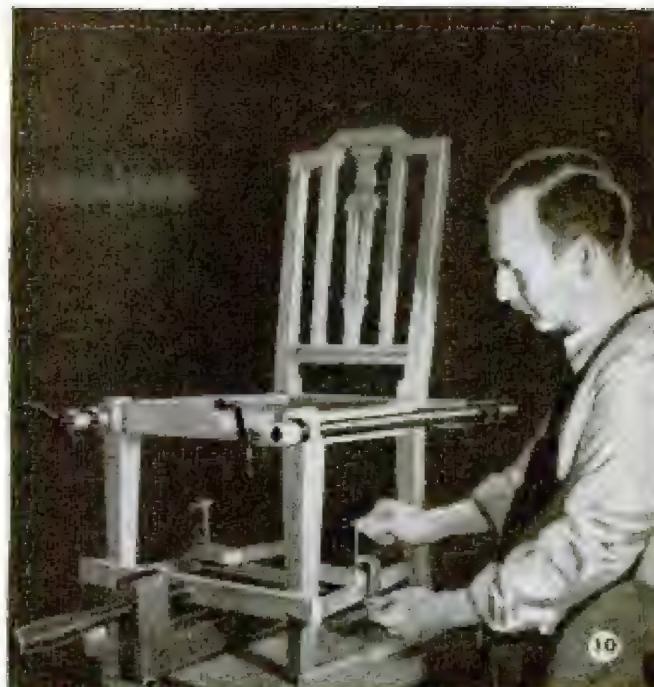
Next, an upholstery rabbet is cut in the seat rails and across the front legs, Fig. 7, making it slightly deeper on the legs. The front legs now can be glued to the front seat



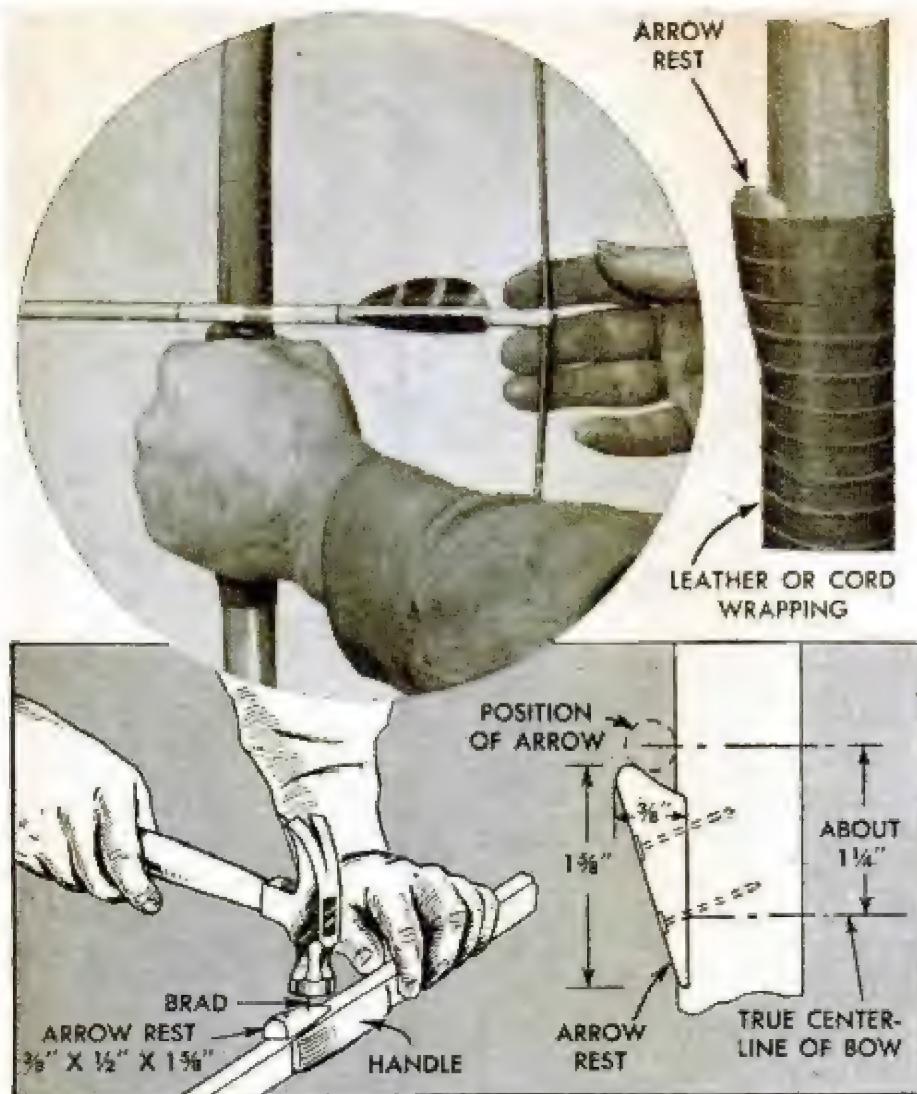
rail and the back posts glued to the lower cross rail, the seat rail and the upper cross rail. It's a good idea first to try assembly without glue. Do not glue any other parts at this time. Two side back splats are required, which are tapered, as shown by the dotted lines in Fig. 9, to leave a $\frac{1}{4}$ -in. shoulder around the tenon at the lower end of the splat. The back-splat pattern, Figs. 9 and 11, is traced on a piece $\frac{3}{4}$ by 3 by $16\frac{1}{16}$ in., then sawed to shape. In carving the splat, work from the sectional views in Fig. 11.

The top rail, Figs. 7 and 9, is cut from $1\frac{1}{8}$ -in. stock. The offset over the center splat is cut out first, then $\frac{1}{2}$ -in. dowel holes are drilled 1 in. from each end and mortises are cut for the splats, after which the sawing can be completed. Do not cut this to exact length until after assembly. After drilling the top of the posts for dowels, the parts are ready for gluing and clamping to the rest of the back. When the glue has hardened, the back assembly is clamped to a bench so that the back may be fluted as in Fig. 8, making the cuts as indicated in the sectional views. Use a very shallow veining to simulate the mitered effect in the top rail. After the stretchers, Fig. 12, have been fitted, assemble the chair in clamps for a trial fit as in Fig. 10. Then apply glue and clamp the parts together. Corner blocks glued and screwed in the seat complete construction.

To finish, coat the wood with an oil stain. Allow to dry for 24 hours, then seal with a coat of thinned white shellac or prepared sealer. Next fill the grain with a paste filler colored a shade darker than the stain and thinned with turpentine to the consistency of thin varnish. The filler should be well rubbed in and wiped off across grain with a coarse cloth. The wiping is done when the filler begins to flatten. If one coat does not fill the pores completely apply a second coat. The "heel" of the hand is good to pack the filler level with the surface before wiping. Let dry for 36 hours, after which any rough spots should be sanded lightly. Follow with a full-bodied coat of white shellac and when dry rub with fine steel wool. Finish with several coats of paste wax rubbed to a fine gloss. A hair-bristle brush will polish the carved surfaces. The simplest upholstery job is a foam or sponge-rubber cushion supported on a bottom of $\frac{3}{8}$ -in. plywood. This is covered with a layer of muslin and tapestry in whatever pattern you wish. The edges of the top covering are nailed in the upholstery rabbet and the job is finished with upholstery gimp applied to the edge of the seat to conceal the tacks and provide a neat finish to the raw edges of the covering on all sides.



Rest on Bow Eliminates Danger of Feather Cuts

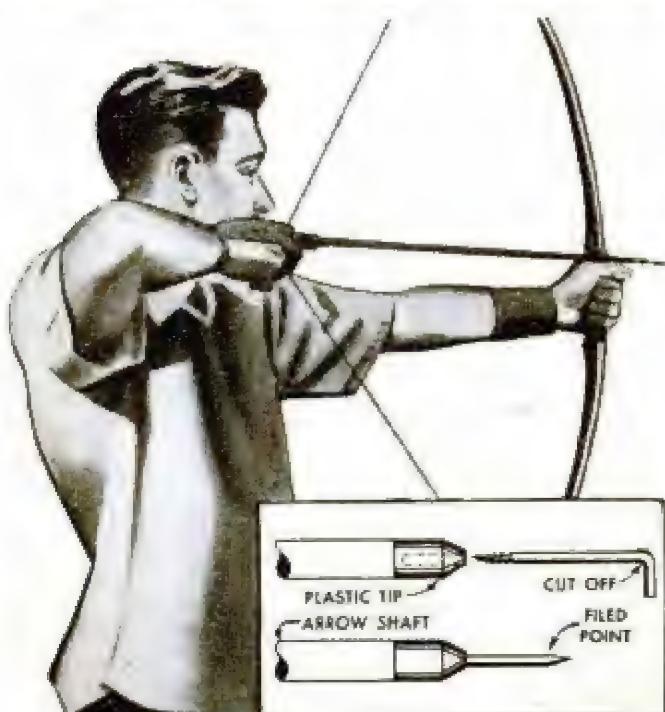


By fitting an arrow rest on the hand grip of an archery bow you can improve your aim as well as eliminate danger of the feathers on the arrow cutting your hand. The rest is a small piece of hard-wood or plastic shaped to fit the side of the bow and nailed in place so that the arrow will rest about $1\frac{1}{4}$ in. above the true center-line of the bow. The illustrations show the rest fitted to an English or long bow, but it can be fitted to flat or semiflat bows just as well. The small brads used to hold the rest in place do not weaken the bow. A workmanlike job is done by wrapping the grip with leather or cord as shown. A short length of red thread wound around the bowstring at the nocking point will serve as a guide in nocking the arrow at the same angle for each shot.—Sam Brown, Marion, Ohio.

Metal Pointon Plastic-Tipped Arrow Increases Penetration

If you have plastic-tipped arrows in your archery kit, deep-penetration points can be made for them with screw hooks similar

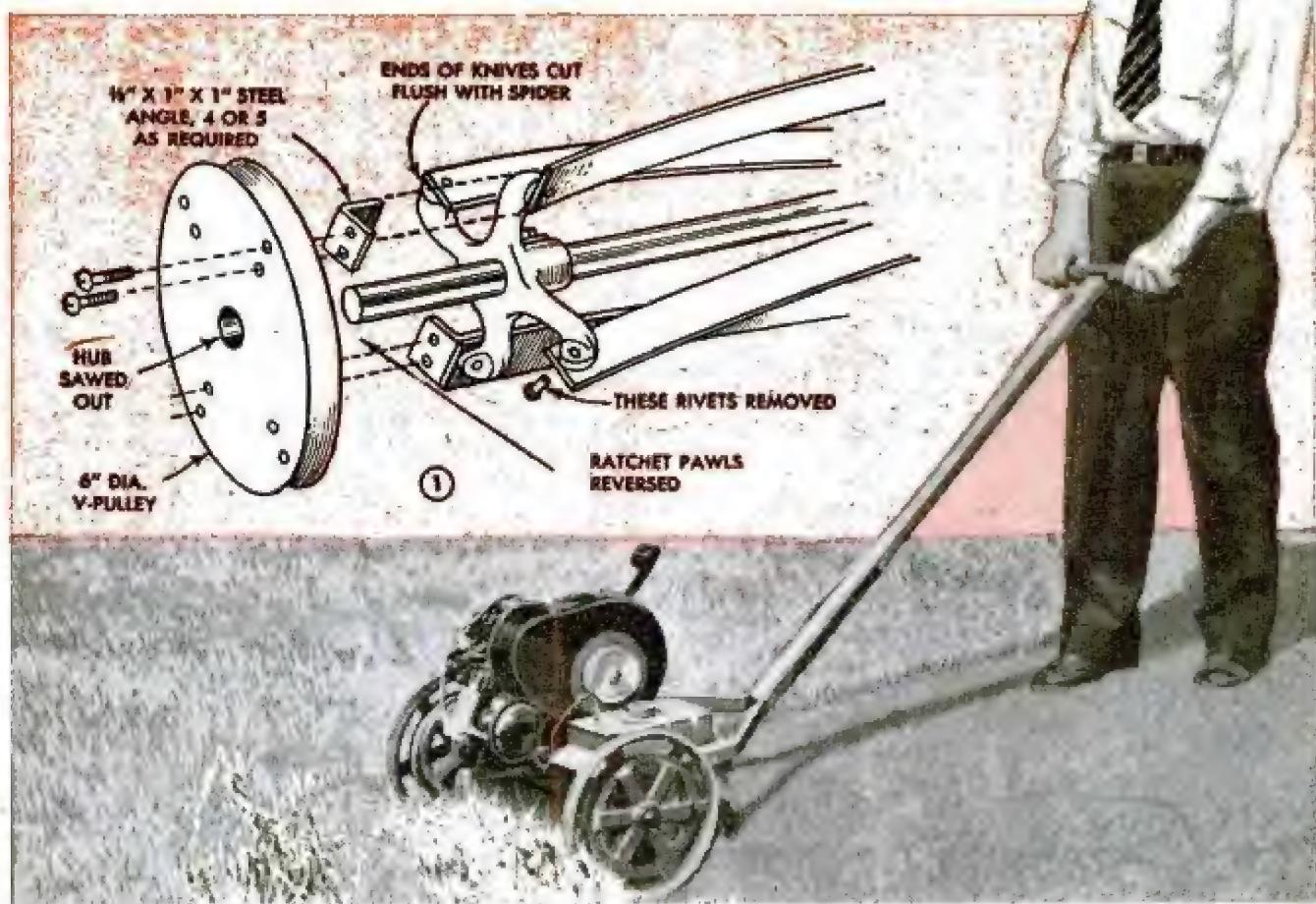
to the one illustrated. The end of the plastic tip is ground flat, center-punched and drilled to receive the screw. After the screw is fastened in the tip, the hook is cut off and a sharp point is filed on the flank. The adaptation is especially effective for light bows because of increased penetration when used against wooden objects or for hunting and also because the arrow will not tear a straw-backed target to pieces as quickly as will one with a broader head. With heavy bows a broader head is superior.—John L. Story, Fort Worth, Tex.



Woodchuck Trap Is Concealed By Log at Burrow Opening

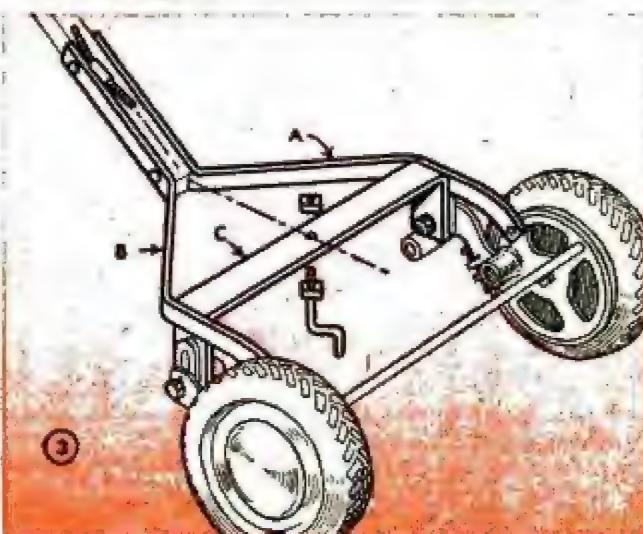
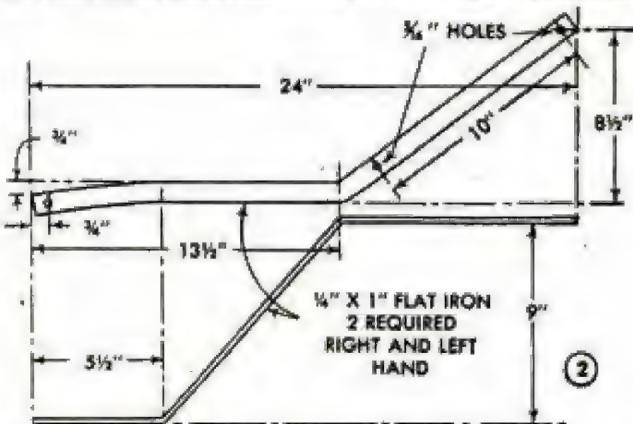
Woodchucks, which are difficult to trap, can be caught if a log is placed before the entrance of the burrow some time before the trap is set. The animal becomes accustomed to the log and will jump over it to get out. Then a trap is placed on the side of the log away from the burrow opening so that the animal will jump into the trap.

Motorize Your LAWN MOWER



By Sherman Butler

IT'S easy to take the "push" out of a hand-power lawn mower with a $\frac{5}{8}$ - or $\frac{3}{4}$ -hp. gasoline engine and a few pieces of flat iron. These small, compact engines can be mounted on almost all hand lawn mowers of 18-in. cut or wider. Due to the relatively higher speed and steady forward movement over the ground the grass is cut more cleanly and uniformly. Moreover, the mower will handle taller and heavier growth than can be cut by hand power alone. In this particular type of drive the motor is belted directly to the cutting reel so there's no need to bother about "differential" or a clutch with a complicated throw-out mechanism. Needed differential is taken of by slippage of the drive by a light downward pressure on the handle as you steer the mower on desired. Declutching is accomplished simply by bearing down on the handle when you want to stop or make a turn. This, in turn, raises the drive weight to the roller, which shifts the weight to the roller, allowing the mower to be turned in any direction or pulled backward to clear a fence, shrub or other obstruction.



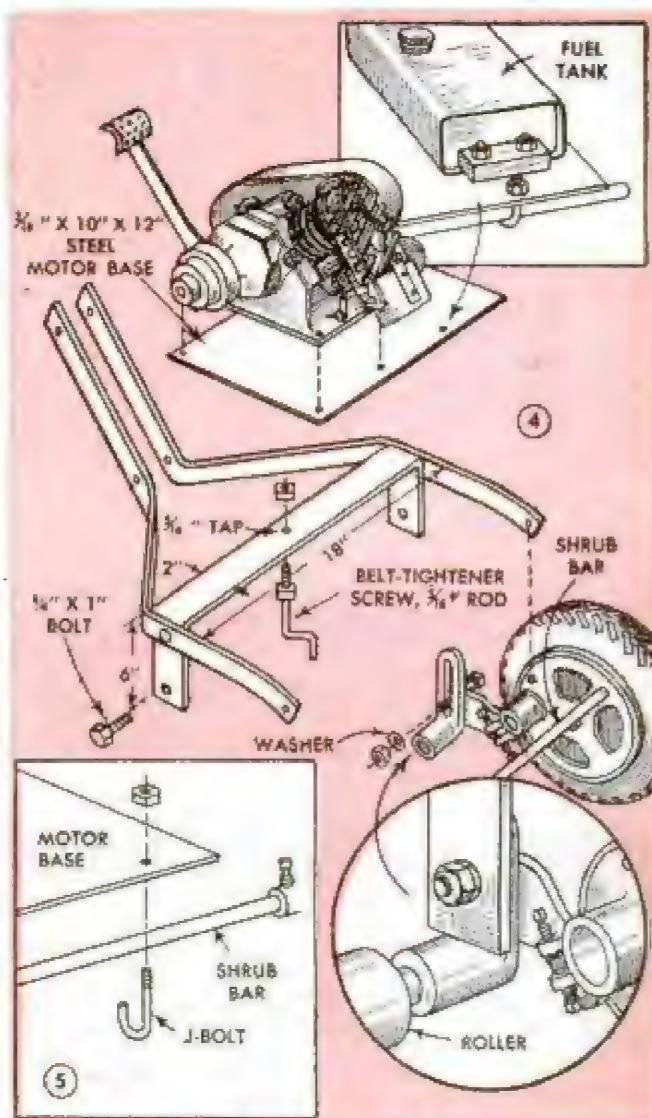


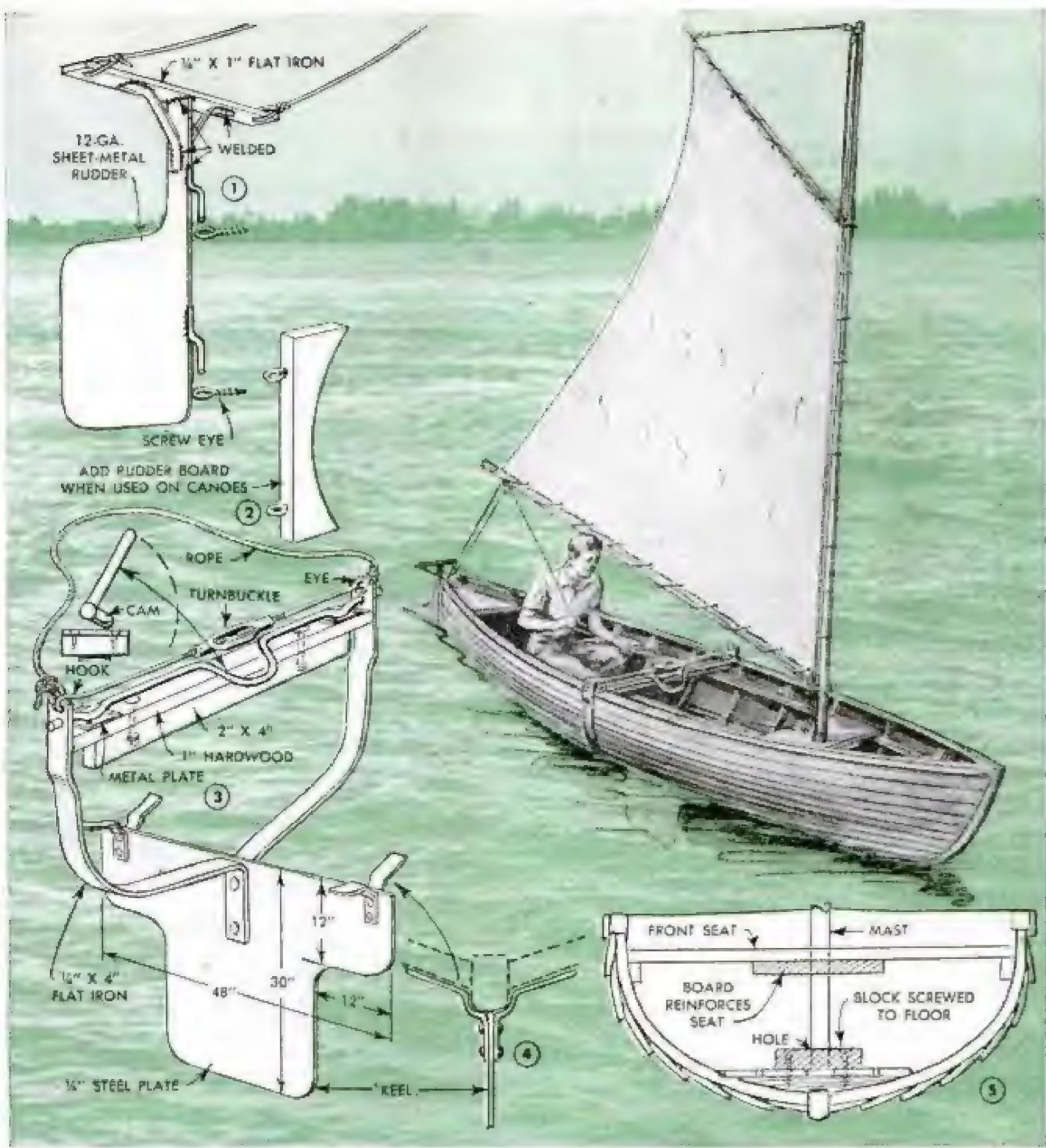
The first thing to do when installing the power drive is to disassemble the mower, removing the reel and the handle. Save the wood section of the handle assembly. Usually, because of the nature of the installation, it will be necessary to make a new yoke, Fig. 2. When removing the reel be careful not to lose or damage any part of the bearings. Fig. 1 shows the method of attaching a pulley to the end of the reel. Diameter of the pulley may have to be varied to suit the mower at hand. The four-blade reel shown in Fig. 1 is not standard as some mowers are fitted with five blades. Ends of the blades projecting beyond the spider are cut off flush and the rivets removed as shown. Steel angles are attached to the spider with stove bolts which pass through the rivet holes. Although a standard metal V-pulley can be used as in Fig. 1, it may be necessary to cut the hub to obtain a free fit between the spider and the inner end of the reel-shaft bearing housing. A pulley also can be turned from $\frac{3}{4}$ -in. hardwood or waterproof plywood of the same thickness. Use lock washers on all bolts in this assembly.

Fig. 3 shows the flat-iron parts which are made and attached to the mower frame. The two parts of the handle yoke, A and B in Fig. 3, are detailed in Fig. 2. However, the dimensions and the bends indicated are

intended merely as a rough guide to the size. Different types of mowers will require some variation. Measure the mower at hand to determine the dimensions required before cutting material.

Connect Fig. 3 with the details in Figs. 4 and 5 and you will readily see how the additional parts of the engine support are fitted on the mower frame. Note that the engine sub-base, made from a steel plate, is hinged on the mower shrub bar as in Fig. 5, and rests on the end of the belt-tightener screw, Fig. 4. This simple arrangement allows easy adjustment of the belt tension. With these parts made and fitted, reassemble the mower with the ratchet pawls reversed in the drive pinions. Be sure to slip the V-belt over the reel pulley first. Bolt the engine and fuel tank in position as in Fig. 4, making sure that the pulleys align properly. Size of the engine drive pulley will depend on the average speed of the engine and you can easily calculate the required diameter of the pulley once the speed of the engine is known. By installing a throttle control on the handle as in the photo, Fig. 1, the engine speed usually can be controlled so that the mower is driven at a comfortable walking pace.





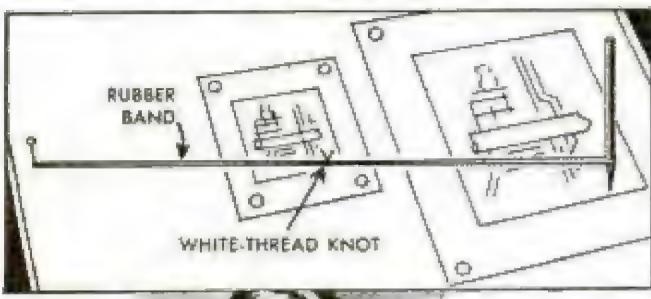
Once this detachable keel is installed on your rowboat and locked in place with the camming arrangement shown you not only can run free before the wind with a suitable sail but you also can do systematic tacking in any safe sailing waters. For fishing or other uses where the rowboat's shallow draft is necessary or desirable, simply unclamp the keel assembly and slide it over the stern, then unstep the mast and there you are, ready for the oars again. Only general dimensions are given in the details, Figs. 1 to 5 inclusive, as the clamping yoke and saddle arrangement must be made to fit the boat at hand. The halves of the saddle are shaped to fit the

Let the Wind Give You a Thrill

curves of the hull near the midship section and the top ends of the halves are offset slightly as shown to clear the gunwales. After bending to shape, the parts are riveted to the keel as in Fig. 3. Projecting "ears" or pads also are riveted to the ends of the keel, Fig. 4, to give a more rigid bearing. Of course you must have a rudder, Fig. 1, and, if attaching the keel to a canoe, you will need the rudder board, Fig. 2. Usually the front seat can be utilized as a mast step where indicated in Fig. 5. Only one method of rigging the sail is shown. There are, naturally, other rigs which are equally simple and safe.

C. L. Meehan, Lakeview, Ont., Can.

Substitute Pantograph Improvised With Few Materials

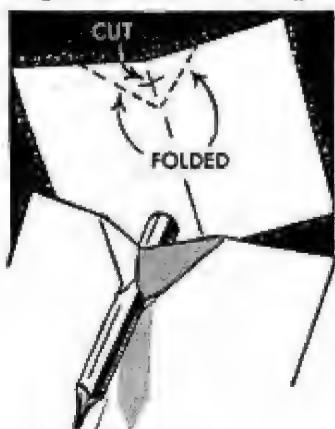


Although a pantograph is used ordinarily to enlarge drawings and sketches, when one is not available a substitute can be made by employing a rubber band, a pin and a pencil. The sketch to be enlarged is placed on the center of the drawing board and the pin is fastened to the left of the sketch. The paper for the copy is thumbtacked to the right. Then the rubber band is looped over the pin and the pencil, and a piece of white thread is tied around the center of the rubber. The thread functions as does the stylus on a pantograph. When the rubber is stretched by the pencil and lines are drawn with the knot following lines on the original, the enlarged sketch is recorded on the copy. Some practice may be necessary before the proper degree of skill is acquired.

Hole in Golf Score Card for Pencil Keeps Both Together

By creasing the center fold of a golf score card, as shown, and punching the corner, a pencil can be kept in the hole so it will

always be at hand for marking scores. Held in this way, the pencil is not so likely to be lost as when carried loose in a pocket, from which it may be jerked when the score card is withdrawn.
—Darwin Curtis, Winnetka, Ill.

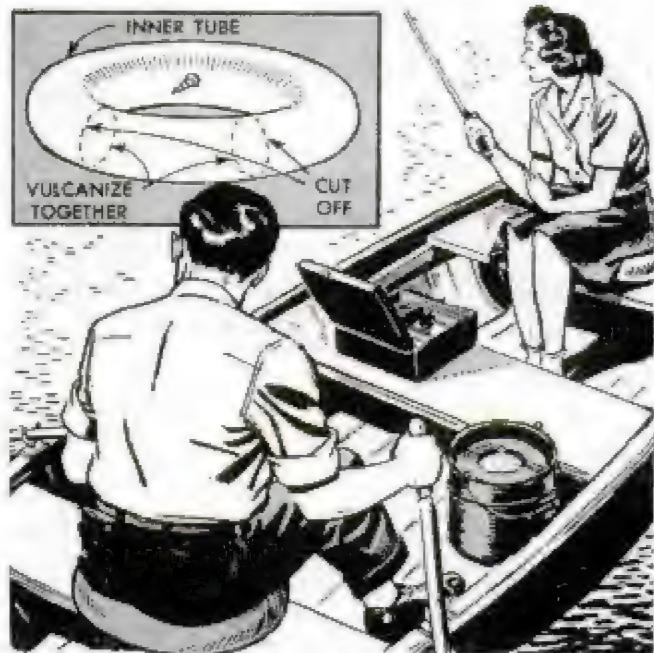


Steel Rod Is Used as Shear Pin

If you have no standard bronze shear pin for your outboard motor, you can make one from any kind of steel rod of the proper diameter by sawing the rod halfway through in two places. The two cuts should be spaced a distance equal to the diameter of the propeller shaft and should be positioned to come on a line between the shaft and propeller hub. Weakening the steel pin gives it about the same shearing strength as a bronze pin.



Cushion Is Fashioned From Tube Of Automobile Tire



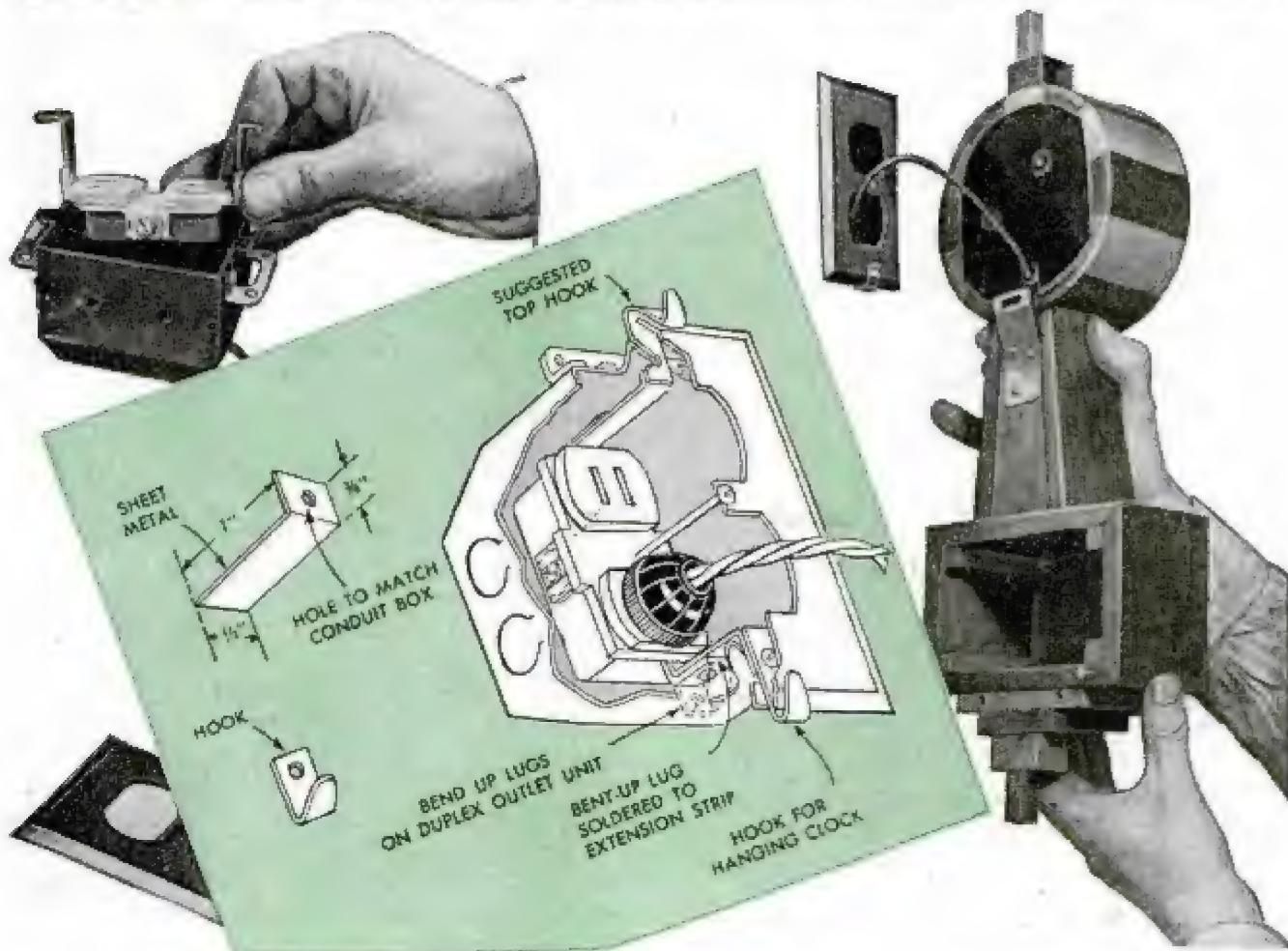
An old inner tube makes a good boat cushion when fishing. A section of the tube is removed and the ends are vulcanized together to make a "doughnut" of the proper size. If the valve core is removed, the tube can be inflated by mouth and sealed by screwing a valve cap on the stem. When not in use, the tube is deflated so that it can be carried in a small space. An added feature of this type of cushion is that it can be used as a life saver in an emergency.

Wax Protects Window Sills

If wax is applied to window sills that are painted, the coating will protect the paint from dirt and the surface can be cleaned without streaking. Wipe the sills with a dry cloth two or three times a week and it will seldom be necessary to wash them.

Joseph G. Cleveland, Minneapolis, Minn.

Electric-Clock Wall Outlet Hidden From View



The simple conversion of an ordinary duplex receptacle makes this combination outlet and hanger for your electric wall clock. First bend the mounting lugs of the duplex unit upward so they stand at right angles to their former position. This allows the unit to slip into a standard outlet box. Two strips, cut from $\frac{3}{16}$ -in. flat steel to the same width as the original lugs, are soldered to the latter to form extensions. In the regular-size outlet box these will be

about $1\frac{3}{8}$ in. long. Bend $\frac{3}{8}$ in. of the top end of each extension at right angles to form mounting lugs and drill holes duplicating those in the originals. Then assemble, making a hook and, if necessary, a bracket for hanging the clock. Cut the clock cord about 6 in. long and attach a plug that will pass through the holes in the cover plate. You may have to bend the hook to clear the starting and setting knobs and the cord.

Walter E. Burton, Akron, Ohio



Durable Bathinette Cover Is Made With Canvas and Clothesline

A durable bathinette cover that can be removed and washed is easily made from a piece of light canvas approximately 5 in. longer and wider than the top of the baby's bath. The sides and ends should have a hem $1\frac{1}{4}$ in. wide in which twelve notches and the corners are cut as shown. A length of clothesline is threaded through the hem and hooked over the corners and also over twelve screws driven into the sides and ends of the frame, or better still, into the underside. Then the rope is drawn tight to make the cover secure.

Richard C. Hare, Grafton, Mass.

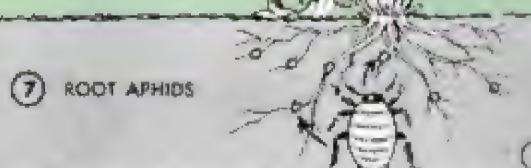
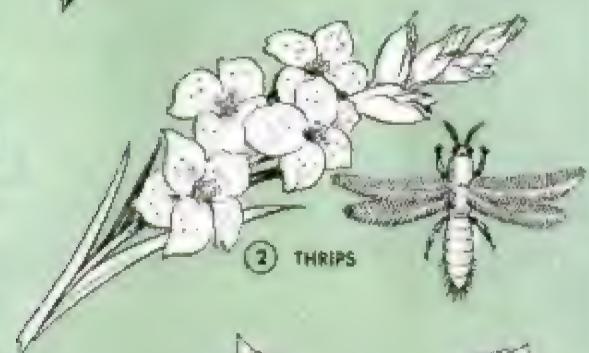
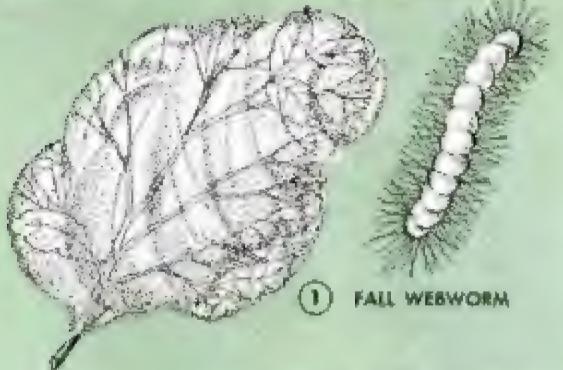
For added strength in thread used for sewing buttons, draw it through beeswax.

25 Insect and how

By W. Clyde Lammey

WHEN suddenly you find seedlings, transplants or carefully nurtured perennials wilted, drooping or otherwise just managing to live in a half-hearted fashion, and you know your cultural methods are approved, then usually there's only one other answer—bugs. Worst of all, you don't always know just when or where the pests are going to strike. That's why experienced gardeners always keep a "loaded" sprayer or duster handy, just in case.

Insect pests that damage your garden generally are of two kinds—sucking and chewing, the terms referring to the manner of feeding. Depredations of most of the common chewers show up quickly and usually the offenders are discovered easily and put out of business. But certain of the sucking insects work less openly and are so tiny that they are not discovered by a casual examination. Moreover, they generally are controlled only by sprays or dusts that kill by contact, that is, the spray or dust must strike the body of the insect to be effective. Against certain other spreading pests, such as the European corn borer, only preventive methods are used at present, although these insects doubtless soon will be brought under a measure of control by newly developed sprays and dusts now used experimentally. Of course, manufacturers do not market these new products until they know what they will do, hence most of the old stand-by sprays and dusts still are recommended for effective control measures. Many of these as originally known have been newly compounded to give greater effectiveness. For the vegetable garden one of the most efficient insecticides at present is that containing rotenone and pyrethrum in combination. Used either as a spray or dust, it kills the common sucking and chewing insects and is relatively nonpoisonous. In a general way, dusting is fully as effective as spraying in the vegetable garden



Pests

to control them

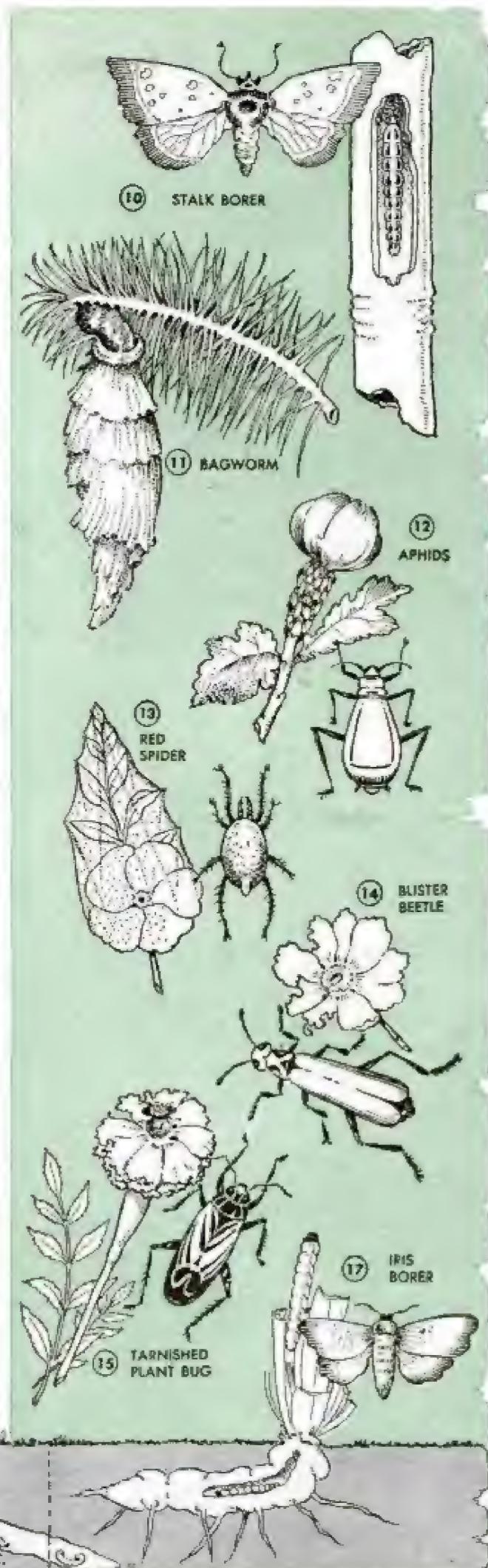
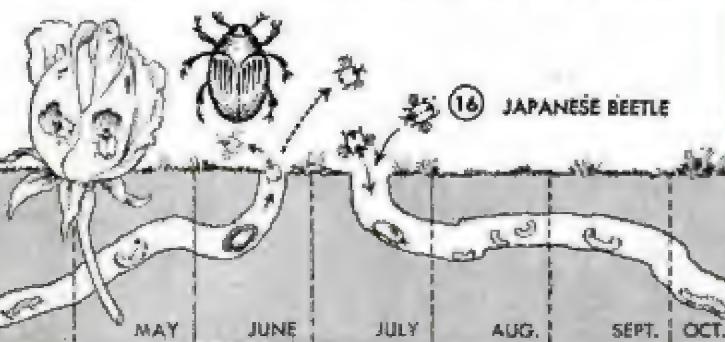
and it requires less expensive equipment.

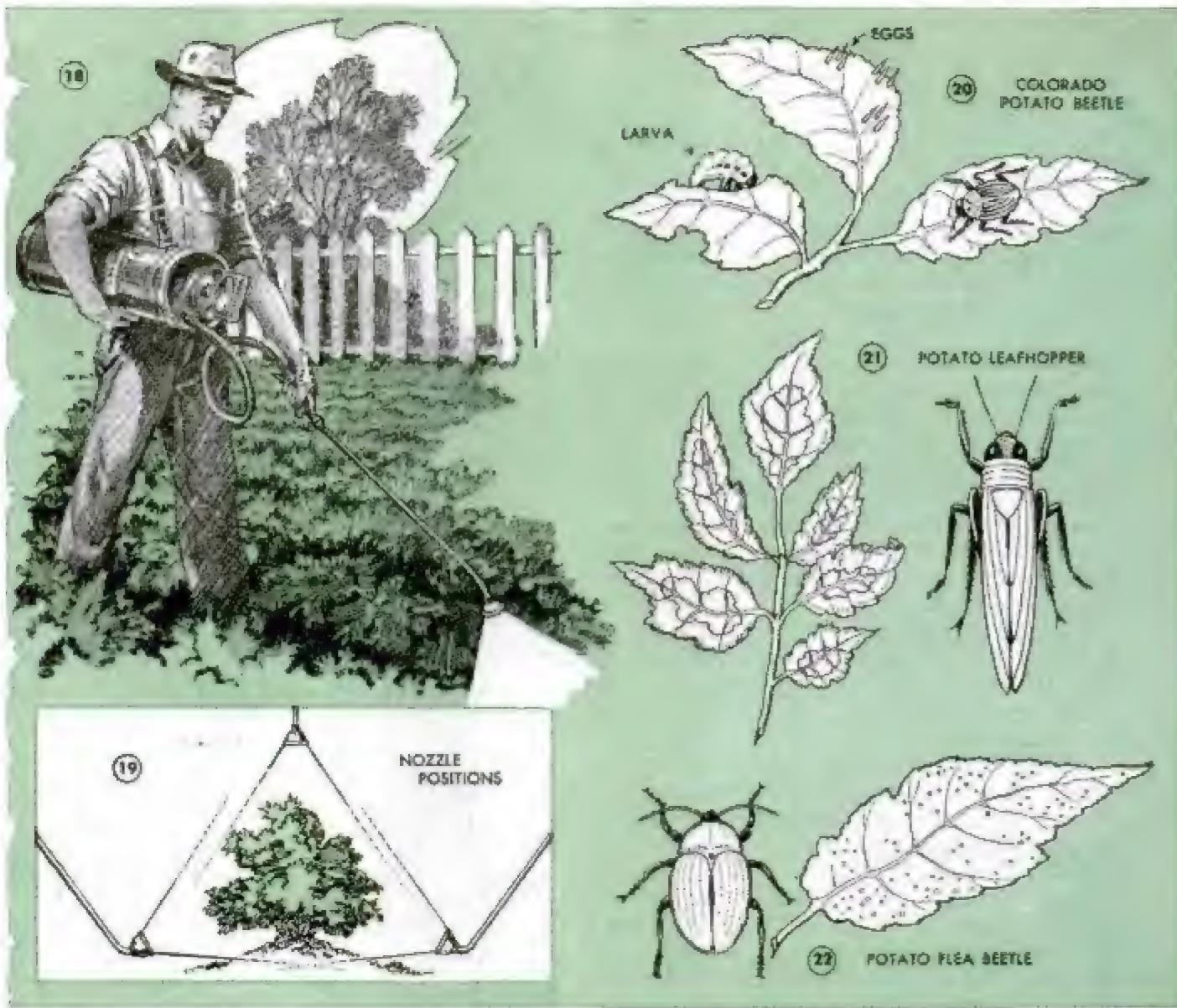
Only general recommendations have been given below for the proportions of the sprays and dusts named. In many instances somewhat different proportions of the materials have been found to be more effective in a given locality. Your state agricultural experimental station will recommend spray or dust compounds which have been found most effective under local conditions and also will advise you in the best use of new insecticides. Should manufacturer's directions for compounding sprays or dusts differ from those given, follow the maker's recommendations.

Figs. 19 and 33 show an important point in dusting or spraying low-growing plants. Fig. 19 shows the three positions of the spray nozzle necessary to cover both the top and underside of the leaves. This is essential when spraying such plants as potatoes. A similar procedure is necessary in dusting most low-growing plants, Fig. 33. When dusting, use the deflector nozzle as in Fig. 32. Figs. 18, 29 and 34 show three types of sprayers suitable for use in the average garden. For the larger plots and where a small orchard is included the wheelbarrow sprayer, Fig. 34, is perhaps the best selection, as higher nozzle pressures are possible with this type. Figs. 30 and 31 show three types of dusters. The small hand types, Fig. 30, are suitable where only a few plants or shrubs are to be treated. The larger "knapsack" type, Fig. 31, is better for larger areas, as it delivers a greater volume of dust and gives better coverage.

Only 25 of the principal insect offenders are listed here. There are many others, of course, but they are not so bothersome. Among the first dozen or so are several species that are especially troublesome in the flower garden but also attack many other plants and shrubs.

Fall webworm, Fig. 1. Ties a silken web around leaf clusters on which the worms





feed. Attacks shrubs, fruit and shade trees. One effective control measure is to cut off and burn the webs, making sure that every worm is destroyed. Or spray foliage with lead arsenate at intervals, a general recommendation for the solution being 1 to 3 level tablespoonfuls to the gallon of water. Less destructive generally are the garden webworm and the parsnip webworm. Control by dusting with calcium arsenate.

Thrips, Fig. 2. Minute flylike insects, less than $\frac{1}{8}$ in. long. Larvae of the gladiolus thrips winter on the corms. Store the corms in sealed paper bags containing naphthalene flakes at the ratio of 1 oz. of flakes to 100 corms. During the growing season spray foliage with a 1 to 200 dilution of pyrethrum or with a solution of 1 rounded tablespoon Paris green, 2 lbs. brown sugar and 3 gals. water.

Leaf roller, Fig. 3. In three common varieties, the oblique-banded fruit tree roller, the red-banded roller and the strawberry-leaf roller. Watch for them on fruit trees and strawberry plants and spray early with

lead arsenate to catch the worms at the first infestation.

Rose slug, Fig. 4. Larvae of rose sawflies, of which there are three common species. Slugs skeletonize the leaves as shown. Can be controlled with a dust composed of 9 parts fine dusting sulphur and 1 part arsenate of lead, a 3-in-1 copper spray, or nicotine sulphate, 1 teaspoonful to 1 gal. water and 1 oz. soap.

Lined plant bug or squash beetle, Fig. 5. An active, destructive pest. Attacks several common flowers including zinnias. Also skeletonizes leaves of squash, cucumber and melon vines. Cover vines and leaves with dust containing rotenone.

Rose leafhopper, Fig. 6. A tiny sucking insect attacking nearly all varieties of roses. Spray with nicotine sulphate and soap in proportions given for rose slug, or use spray containing pyrethrum.

Root aphid or root lice, Fig. 7. Attacks roots of asters principally. Mix wood ashes with soil when setting out seedlings. Pour

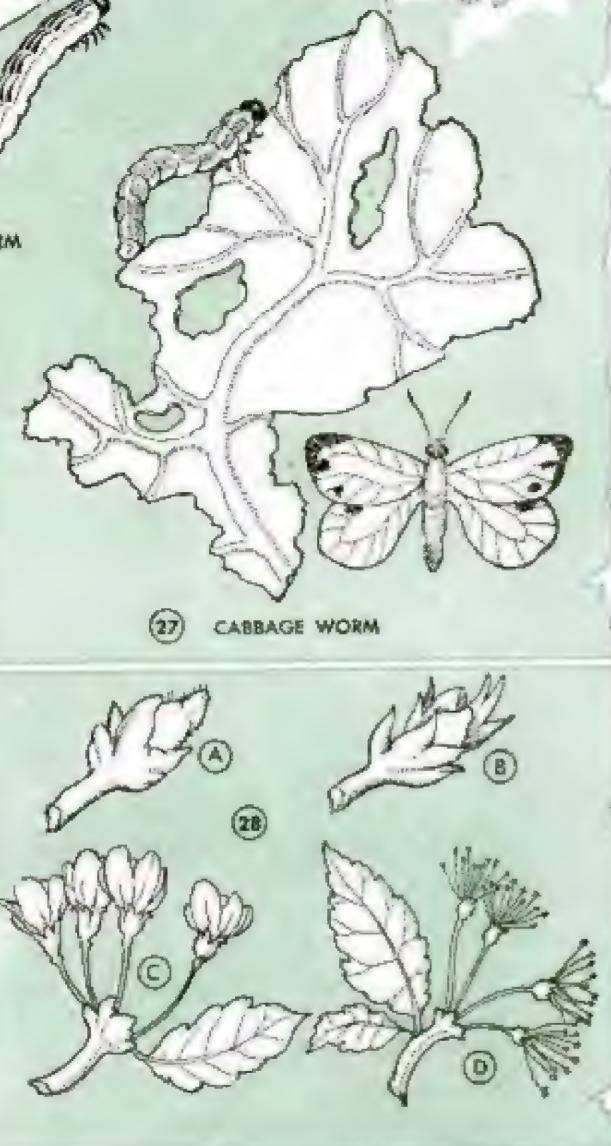


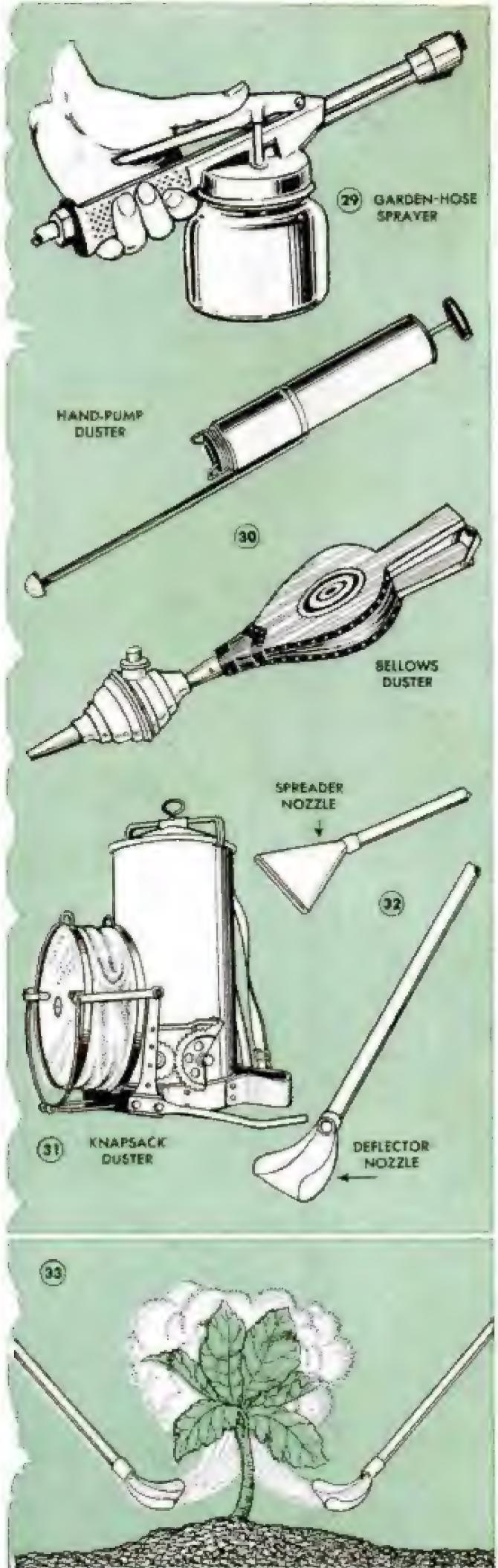
nicotine sulphate solution or carbon bisulphide around base of plants, covering a space roughly equal to root area. If you use carbon bisulphide for this or any other purpose keep the fire hazard in mind and do not inhale the fumes.

Cutworm, Fig. 8. Specializes in lopping off tender seedlings at the ground level. Scatter poison bran made by mixing 1 oz. white arsenic, 1 lb. dry bran and 2 tablespoonfuls molasses in 1 qt. water. To protect songbirds place the bait under wide boards laid in line and close to the plants.

Root slug, Fig. 9. Especially bothersome on young delphiniums. Spread air-slaked lime, tobacco dust, soot or wood ashes around the plants. Mix lightly into the top soil. Dust slices of raw potato with Paris green and place near plants.

Stalk borer, Fig. 10. A serious pest in valuable growth because damage is done and the plant wilted or toppled over completely before borer's presence is known. Common native borer works in stems of any plants large enough to shelter it. There





is only one yearly generation or "hatch." But the newer and more menacing European borer, or corn borer, as it is generally known, produces a second and sometimes a third generation in a single season. The European borer does not confine its ravages to corn alone, but attacks a variety of plants, dahlias, zinnias, garden sunflowers, potatoes and gladioli being among the chief sufferers. At present control methods are generally preventive—burning or plowing under infested growth and any stalks, or trash in which the pest winters. During growing season the borers can be killed in individual plants by slitting the stalk just above the point where the borer entered and injecting a few drops of carbon bisulphide or nicotine sulphate. Tall plants so treated must be supported with a stake or by other means. Sprays, dusts and other control methods now being developed promise more certain control of this pest in the near future.

Bagworm, Fig. 11. Destructive shrub and shade-tree pest in certain sections of the United States, and an especial enemy of evergreens. Gather and burn the conspicuous "bags" and spray infested growth with lead arsenate during spring and summer months when larvae appear.

Aphids, or plant lice, Fig. 12. Aphids attack almost any garden or greenhouse crop. Heavy infestations are particularly serious because the tiny lice act as carriers for many plant diseases. Pyrethrum-rotenone compounds used as spray or dust and nicotine sulphate-and-soap sprays are effective on practically all growth.

Red spider, Fig. 13. Not really a spider at all, or even an insect, but rather a tiny mite weaving almost invisible spiderlike webs on the underside of leaves of many vegetables, ornamental plants and evergreens. Hosing evergreens with water under high pressure will discourage the spiders, but a better method is dusting with fine dusting sulphur, being careful to cover the growth thoroughly. Pyrethrum-rotenone sprays or dusts are effective on other plant growth, but care should be taken to assure that the spray or dust hits the undersides of the leaves as well as the tops.

Blister beetle, Fig. 14. Slim-bodied, lively beetles about $\frac{3}{4}$ in. long. Voracious feeders on the foliage of many vegetable, flower and field plants. Spray foliage with lead arsenate solution. Where flowers are infested knock the beetles out of the blooms into a pan containing kerosene.

Tarnished plant bug, Fig. 15. An active but inconspicuous bug about $\frac{1}{4}$ in. long, brown-mottled in color. Feeding habits

cause wilting and blackening of leaves and twigs. Difficult to control ordinarily but pyrethrum sprays or dusts generally are sufficiently effective to permit near-normal growth of most plants.

Japanese beetle, Fig. 16. A serious, spreading pest against which many control methods have been tried and discarded. However, recently it has been discovered that soils can be inoculated with spores of a disease fatal to larvae of the beetles. Methods have been developed of producing the spores in quantity. Probably these materials eventually will be available to inoculate infested soils. Dry lime applied thickly to foliage has been found an effective repellent of the adult beetles. Valuable sod can be protected from ravages of the larvae by spreading 5 to 7 lbs. of lead arsenate to each 1000 sq. ft.

Iris borer, Fig. 17. Before growth starts cover beds with straw or dry trash and burn to destroy the eggs. Always keep the fire hazard in mind when burning beds. Spray new growth with arsenate of lead.

Colorado potato beetle, Fig. 20. Perhaps the best known of the insects damaging the potato crop. Spray or dust foliage with arsenate of lead, calcium arsenate or any of the preparations sold as "potato spray."

Potato leafhopper, Fig. 21. Recognized as one of the most serious pests of the potato. About $\frac{1}{8}$ in. long, generally light green in color. Causes the damage to the foliage known as "hopper burn," in which the edges of the leaves curl and become dry and brittle. On small plots use a prepared bordeaux mixture or a prepared potato spray. In either case follow the directions of the manufacturer for small quantities.

Potato flea beetle, Fig. 22. Tiny black beetle a little larger than a pinhead. Eats small round holes in the leaves, giving them a sievelike appearance. Bordeaux mixture, which controls the leafhopper, acts as an effective repellent but must be applied much earlier, when the plants are 3 to 6 in. high. Plants should be sprayed at least five times at intervals of two weeks or oftener during the growing season.

Plum curculio, Fig. 23. Cuts crescent-shaped marks in the fruit. Spray with lead arsenate just after the petals fall. Repeat in a week to 10 days.

Codling moth, Fig. 24. Cause of the familiar wormy apples. Also attacks pear, crabapple, quince and black and English walnut. Spray with lead arsenate, the most important application being that known to orchardists as the "calyx spray," the term referring to the calyx stage or petal fall



of the apple blossom. See D in Fig. 28. To be effective this spray must be carefully timed and used in combination with other spray materials. The first apple spray is known as the "dormant spray" and begins when the fruit buds appear as at A in Fig. 28 and must end before the leaves are $\frac{1}{4}$ in. long, B in Fig. 28. For this spray mix 1 gal. concentrated lime-sulphur and 5 tablespoonfuls nicotine sulphate, 40 percent solution, in 10 gals. water. Or use oil emulsion according to manufacturer's directions. For the "pink-bud spray," C in Fig. 28, use lime-sulphur, 1 qt., and lead arsenate, $1\frac{1}{4}$ cups in 10 gals. water. For the petal fall, or calyx spray, use lime-sulphur, $1\frac{1}{2}$ pints, and $1\frac{1}{4}$ cups lead arsenate. Repeat the calyx spray after 10 days and again 3 to 4 weeks after petals fall. These successive sprays are a recommended procedure for protecting both fruit and foliage of the apple from several insects and diseases, including codling moth.

Pear slug, Fig. 25. Spray with nicotine sulphate or arsenate of lead, making sure that spray covers both sides of leaves.

Corn ear worm, Fig. 26. Attacks when ears are in the silk. Dust silks with a mixture of 1 part hydrated lime to 2 parts lead arsenate, beginning when the silks first show and continuing at intervals. Or use the new corn ear-worm insecticide now available in ready-to-apply form and apply when the silks start to turn brown.

Cabbage worm, Fig. 27. Riddles the first leaves of both cabbage and cauliflower and later on attacks the outer leaves of the formed cabbage heads. Use a combination pyrethrum-rotenone dust. In heavy infestations it is necessary to keep the growth covered at all times.

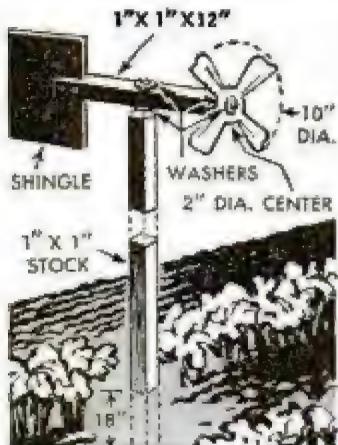
Can of Tennis Balls Is Carried On Side of Racquet Press



By riveting a strip of metal to the can in which tennis balls come and screwing the strip to the racquet press you will provide a handy place for carrying tennis balls. Squeezing the can so it is slightly out of round near the opening will prevent the balls from rolling out if the racquet is laid on the ground.

E. H. Crook, South Pasadena, Calif.

Windmill Drives Away Gophers



An effective way to rid a plot of ground of gophers is to set up a windmill consisting of a sheet-metal propeller rotating on a stick that pivots on a standard driven into the ground. Movement of the propeller will create vibration that is transmitted to the ground.

This causes gophers to leave because the vibration is irritating. For this reason the propeller should not be balanced for smooth operation. A 10-in. propeller cut from light sheet metal is about

the right size. The rudder can be a shingle or a piece of heavy cardboard, and the arm on which rudder and propeller are mounted should be balanced on the standard so that it will veer easily into the wind. The standard may be as high as desired, but it should be long enough to extend at least 18 in. into the ground, with enough above ground to raise the propeller above shrubbery and other vegetation that might screen it from the wind.

W. Stanley Milam, San Francisco, Calif.

Chemical Test for Hard Water

A simple test to determine whether water is hard or soft is to use a solution made by dissolving chemically pure mercurous nitrate crystals in distilled water. A tablespoonful of the crystals is dissolved in a cup of water to make the test solution. If the water to be tested is hard, it will become cloudy when a small amount of the solution is poured into it, but if it is soft it will remain clear. The unused solution may be stored in any nonmetallic container for future use.—J. A. Knoll, Stevenson, Wash.

Fence Posts Held in Hollow Tile Are Removed to Mow Lawn

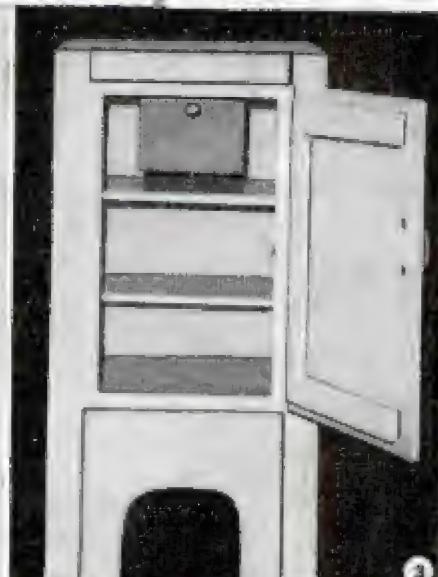
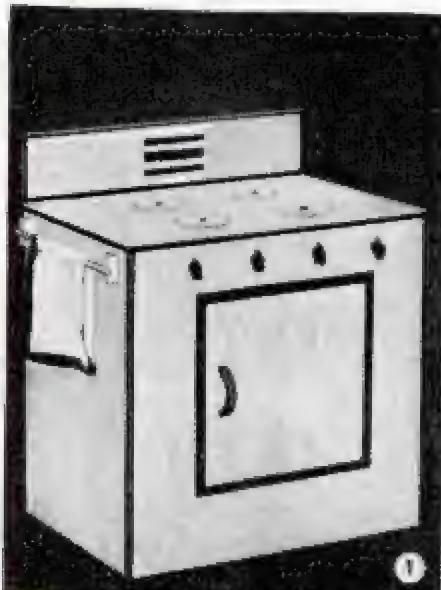
One home owner sank hollow building tiles in his lawn slightly below ground level and cemented them in place to support the posts of a low fence. The tiles do not interfere with the lawn mower and the fence can be removed easily for this purpose as well as for storage during the winter. As the tiles are open at both ends, rain passes through them into the ground so that the posts do not decay.

Duke D'Ambra, Lawrence, Kans.



A Play Kitchen Ensemble for the Young Miss

Eyes will sparkle and the dinner call will ring through the house frequently if you present this kitchen ensemble to that tiny feminine member of your family. With these three pieces a play kitchen can be set up almost anywhere in the house. As an average overall size, the stove, Fig. 1, can be made 19 in. high, 21 in. wide and 13 in. deep; cabinet, Fig. 2, 30 in. high, 18 in. wide and 10 in. deep in the lower section, and the refrigerator, Fig. 3, 30 in. high, 16 in. wide and 12 in. deep. Although solid stock can be used in the construction of all pieces, $\frac{3}{8}$ or $\frac{1}{2}$ -in. plywood is perhaps best as the larger panels can be cut in one piece. If plywood is used, the assemblies should be reinforced with triangular corner blocks glued and screwed to the panels at the joints. While doors on the stove and cabinet are imitated with paint and handles, you can make real doors from plywood reinforced with cleats of solid stock where the hinges are attached. Stove burners also are painted on, but radio snap switches to



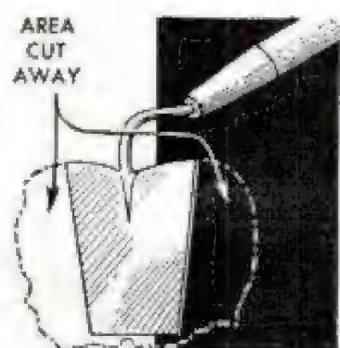
operate the burners add realism to the stove as the "gas" turns off and on with a loud click. The oven-door handle is the carrying handle from a portable radio set.

Real doors in the cabinet, of course, will provide storage space for cooking utensils. Spring-type hinges on the refrigerator door will make it self-closing, and inexpensive weather stripping around the door will serve as a gasket if the little owner insists that the refrigerator is not "cold" enough. The surfaces should be sanded smooth before applying the finish, using coarse, medium and fine grades of sandpaper progressively. Color scheme can be any that matches the playroom, or plain white enamel with contrasting trim.

Francis J. Comegys, Wilmington, Del.

Discarded Garden Hoe Cut Down To Make a Weeding Tool

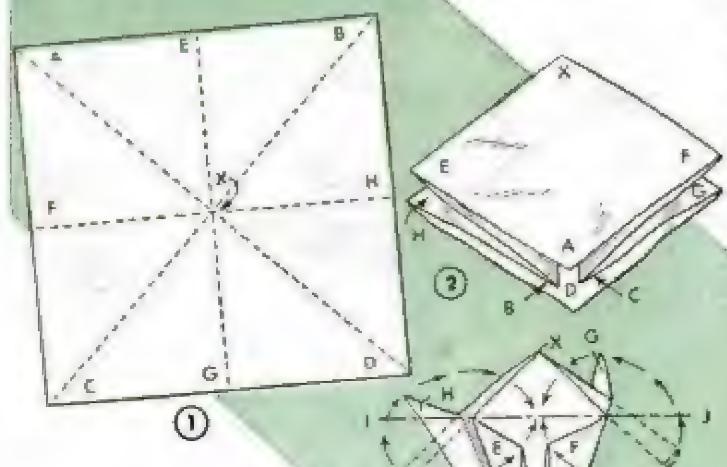
By cutting off the ends and truing the bottom edge of an old garden hoe, one man improvised a tool that was excellent for weeding between closely spaced rows of vegetables. Cutting can be done with a hacksaw or cold chisel. The lower edge of the hoe should be well sharpened for effective use.—Fred Cornelius, El Paso, Tex.





FOLDING Is Fun For

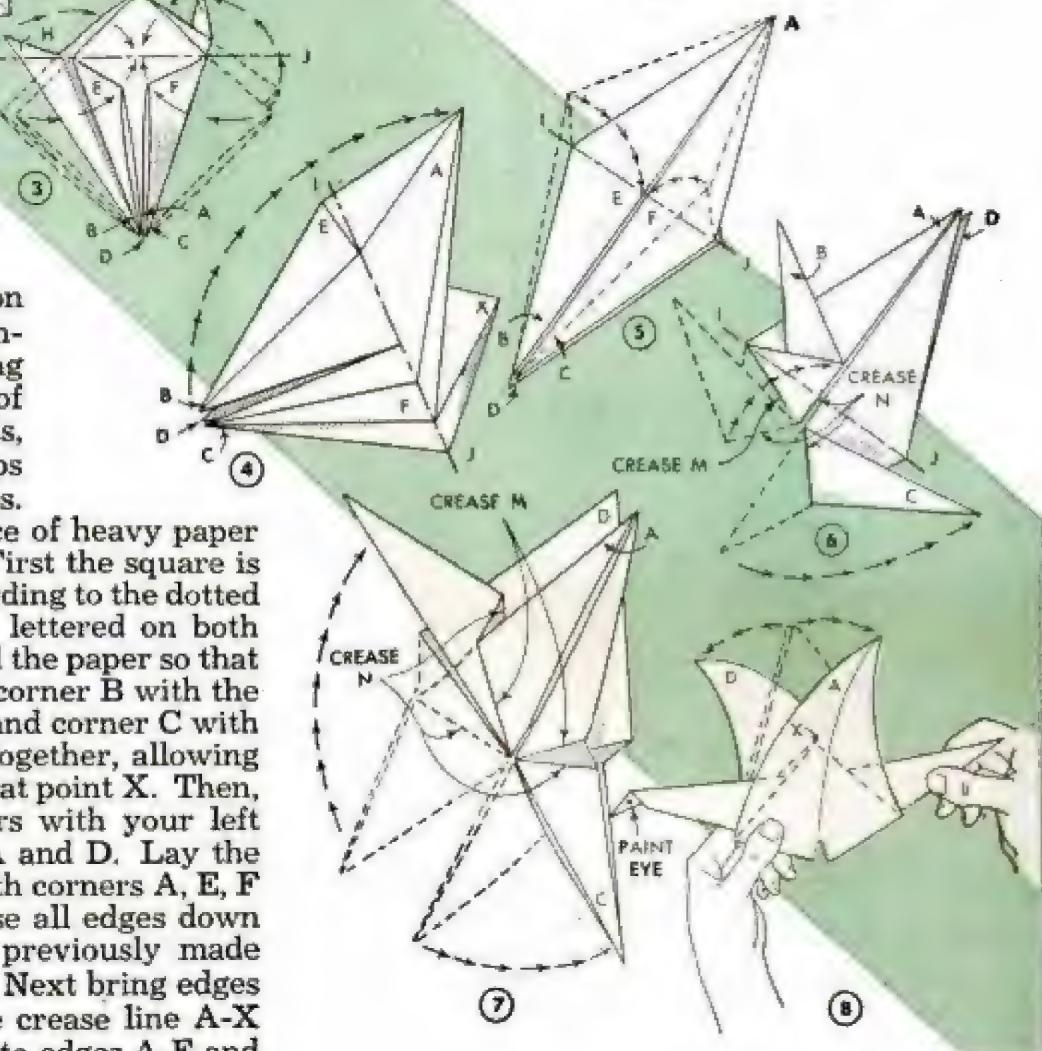
B-E. Now turn the whole thing over and make similar folds by bringing corners H and G to crease line D-X. It now should look like Fig. 3, the arrows showing the direction of the folds. Next place the paper flat on the table with corners E and F showing and mark the pencil line I-J. Place the fingers of the right hand along the edge of the pencil line so that the palm covers point X and with the left hand fold corners E and F outward. Grasp corner A with the left fingers and fold and crease it at line I-J as shown by the arrows in Fig. 4. After this fold corner A flat over corner X. Corners E and F will open up by first swinging out and then back again so that E and F will come together in the center as shown in Fig. 5. Turn the paper over and do the same thing with corner D. Now place the paper on the table with E and F showing and following the dotted lines and arrows in Fig. 6 fold tips C and B upward and outward to form crease N at approximately the



By
Allan Carpenter

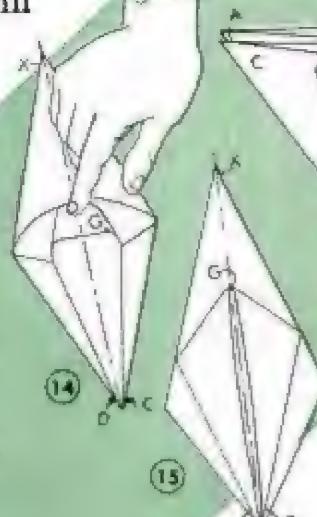
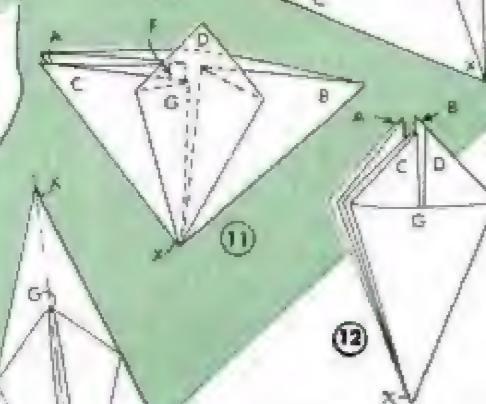
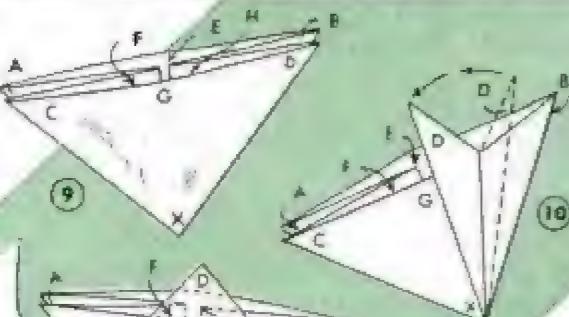
THERE is real fascination for children and grown-ups alike in taking nothing more than a square piece of paper and, by a few folds, producing a bird that flaps its wings or a frog that hops.

For the bird, use a piece of heavy paper about 8 or 9 in. square. First the square is creased by folding it according to the dotted lines in Fig. 1, then it is lettered on both sides as indicated. To fold the paper so that it looks like Fig. 2, grasp corner B with the fingers of the right hand and corner C with the left and bring them together, allowing the paper to hinge or fold at point X. Then, holding these two corners with your left hand, bring up corners A and D. Lay the paper flat on the table with corners A, E, F and X showing and crease all edges down flat. Some of the folds previously made will have to be reversed. Next bring edges A-F and C-F over to the crease line A-X and crease. Do the same to edges A-E and



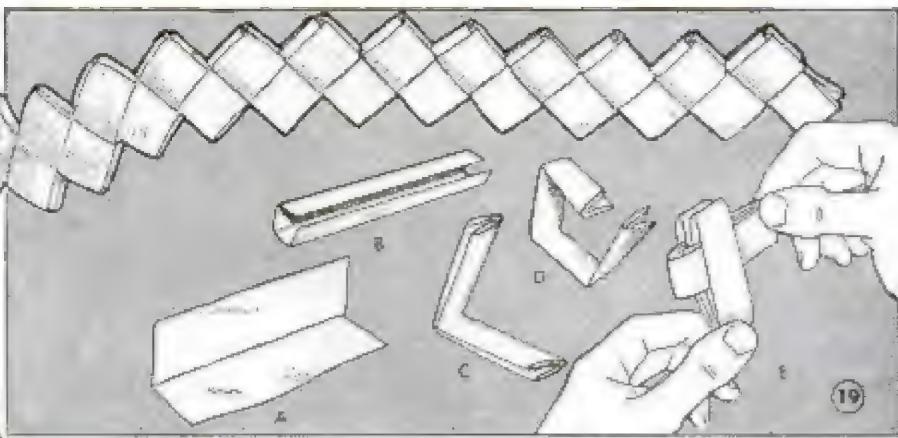
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same position and angle as indicated in Fig. 6. Crease M, extending from the inside corner formed by crease N to the outside corner of I-J line, is folded in a similar manner, except that the paper is folded upward and inward. Return tips C and B to their original positions, as the creases merely serve as guide lines. Now, holding the paper in the left hand with G and H showing, you will find a small triangle between points A and D. Open the right-hand side of the triangle and with the right hand grasp the two edges of tip C just below crease N and move them upward as shown by the arrows in Fig. 7. You will notice that creases N and M on one side of tip C will



have to be reversed to allow crease N to be folded to the center between the two sides of the small triangle. Turn the paper around and do the same to tip B. Points A and D are curved downward to represent wings, while the protruding points form the neck and tail. Fold one of the extending tips to form the head and paint eyes on both sides. Holding the bird as shown in Fig. 8, the wings are made to flap realistically by pulling the tail.

A square folded and labeled as in Fig. 1 also is used to make the hopping frog detailed in Figs. 9 to 18 inclusive. To fold the paper as in Fig. 9, grasp the creased line H with the right fingers and creased line F with the left fingers and bring them together, allowing the paper to fold at point X. Then, holding these corners with the left hand, bring up the crease lines E-G. Lay the paper flat with corners C, D and X showing, and crease all edges down flat. Notice that some of the folds will have to

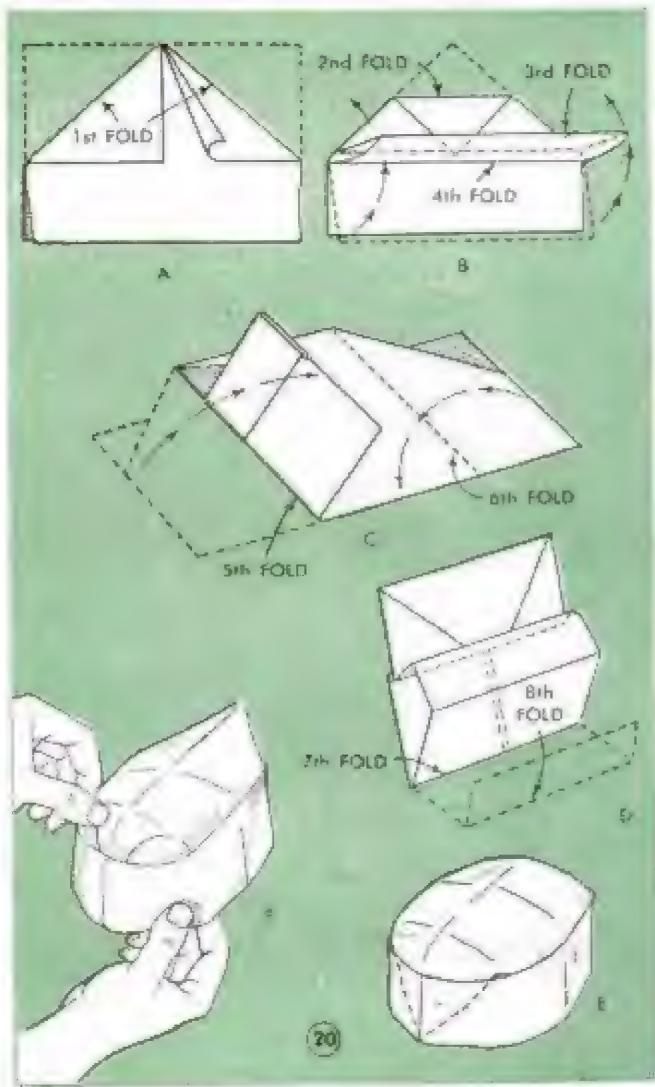


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be reversed. Be sure the labeled crease lines are positioned as in Fig. 9. Edge D-X then is folded over to align with crease line G-X, Fig. 10. Crease this new fold which is to serve as a guide crease when folding as in Fig. 11. This is done by unfolding corner D to its original position. Then, holding the paper at corner X with the left hand, spread the two guide creases apart with the right hand, starting at corner D. Note that the left-hand guide crease has to be reversed. Now flatten the folded edge D-X directly over the folded edge G-X, shown as a dotted line in Fig. 11. Place the paper flat, Fig. 11, and lift up the right-hand guide-line crease so it hinges on the D-X line and fold it over, placing it on top of the left-hand guide-line crease. This exposes crease line H-X. Edge B-X is then folded over so it aligns with crease line H-X and is creased

to form guide lines. Then open up and form it as was done with corner D. Now turn the paper over to show corner A and crease line E-X and repeat the above guide creasing and folding, first to corner A, then to corner C. Grasp the paper with the left hand at point X and fold over the right-hand guide-crease edge from right to left, exposing crease line G-X and corners C and D, Fig. 12. Turn the paper over and repeat, exposing crease line E-X and corners A and B.

The paper then is laid flat with point X away from you and corners C and D showing. Now fold in the top right and left-hand unmarked corners to the center crease line



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G-X and crease as in Fig. 13. These two new folded edges are used as guide creases in the next step, which is somewhat similar to a process in making the bird. Draw a line across the newly formed right and left corners at right angles to the crease line G-X. Then unfold them to their original positions and with your right hand lift up edge G as in Fig. 14 and fold it back along the pencil line, which is creased as in making the bird. The cut edges of the paper will fold in to the center, after which the small kite-shaped folds are pressed flat against the paper, Fig. 15. Turn the paper over to show edge E and repeat the above process. Then locate edges F-H and do the same thing.

Now hold the paper in your left hand with point X at the top and arrange the eight unmarked corners so that the small kite-shaped folds marked G are facing you and the ones marked E are at the back. The two lower tips facing you will be labeled C and D, the back two A and B. Lay the paper flat with G showing and fold the two upper right-hand unmarked corners to the center and crease the fold to taper to a point at tip C. Do the same to the two upper left-hand unmarked corners and crease to tip D, Fig. 16. Turn the paper over, showing corner E, and repeat the above, folding and creasing to tips A and B. Then turn the paper over again and fold tips C and A as in Fig. 17. Fold tips D and B so they project out to the left. A smart tap on the back will make the frog, Fig. 18, jump vigorously.

With heavy wrapping or colored craft paper, any youngster can make a decorative belt. Sixty or seventy pieces of paper about $4\frac{1}{2}$ by $2\frac{1}{4}$ in. in size are required. Each piece is folded lengthwise as in Fig. 19, A, after which each edge is folded to the center crease, B. The ends of this strip are brought together, C, to make the center crease. Then the ends are folded to this crease, as at D. This piece is joined to another, made the same way, by inserting the ends of the latter between the folds, E, and pulling both together firmly. Other pieces are added similarly to produce a belt of the required length.

The cap shown in Fig. 20 is made from a double newspaper sheet. The size can be varied by increasing the size of the paper proportionally. To start, fold down the corners of the paper so that the edges meet, as at A. Then the second, third and fourth folds are made as at B, and the paper turned over before making the fifth fold at C. The latter is really two separate folds. After the sixth and seventh folds are made, C and D, the remaining flap is tucked into a pocket formed by the third, fourth and fifth folds, detail E. Finally, the peaks are tucked under the band at both ends, as in Fig. 20, detail F.

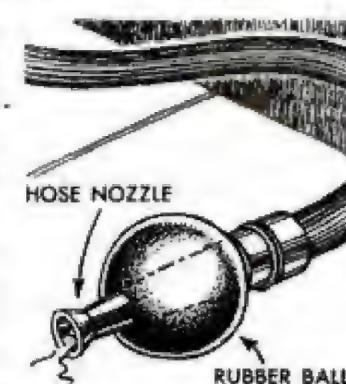
Tires for Model Work Are Wound On Dowel or Rod



Rubber tires for model airplanes and cars can be made with rubber splicing tape of the kind used by electricians. For a form, use a dowel or rod of the same diameter as the wheel on which the tire is to fit, detail 1. The thickness of the wrapping will determine the size of the tire. Then roll the tape off the rod, detail 2, to form the finished tire, detail 3, which then is ready to be put on the wheel.

Rubber Ball Forced Over Nozzle Protects It When Dropped

When used around cement walks, garden-hose nozzles may become nicked or cracked if they are accidentally dropped. As a precaution against this, a sponge-rubber ball can be pierced to slip over the tip of a nozzle so that if the hose is dropped the ball will prevent the nozzle from coming in contact with the pavement.



If boiled and fresh eggs accidentally are stored in the same container, the boiled ones can be distinguished from the others by twirling them on a table. A fresh egg will turn slowly for only a short time, but a hard-boiled egg will continue to spin.



Feet on Legs of Swing Provide Firm Base

Wooden feet attached to the legs of a child's lawn swing and slide will support the swing frame on loose soil and prevent the legs from sinking into the ground. Also, the feet will adjust to uneven ground. Each foot is made by assembling lengths of hardwood to form a channel, the side members being drilled to take a pin, as indicated in the detail. On swings where the legs slant inward the holes will have to be drilled parallel with the bevels at the bottom of the legs so that the feet will rest flat on the ground.

Theodore Welge, St. Louis, Mo.

Bell Attached to Shoe or Lace Indicates Child's Presence

Belling the cat to warn birds of its presence is an old custom, and belling the child, one parent has found, is an excellent way of knowing the little tot's whereabouts. A small bell can be attached to the youngster's shoe or shoelace, and as long as the tinkling sound caused by his movements at play can be heard it will show that he has not wandered.—I. M. Fenn, Chicago.

For a rainy day's entertainment or during a period of convalescence, challenge your child's interest with a half cupful of alphabet noodles. These will prove to be instructive as well as amusing, as anagrams, words and whole sentences may be spelled out with the letters.



Swing Safety Chain Prevents Fall If Hanger Breaks

The hangers on children's swings frequently become worn and break because of friction between the rigid and the pivoting members of the hanger. As a measure of protection if this does occur, these safety chains may be used. One end of the chain is fastened around the crossbar supporting the swing, as shown, and the other end connected to the top link of the swing chain. Then, if the hanger breaks, the swing will drop only far enough to take up the slack in the safety chain. If rope is used instead of chain to support the swing, the same idea can be employed, one end of a safety rope being looped around the crossbar and the other being spliced to the swing rope. Very little slack is necessary in either case.

R. M. Anthis, Twin Falls, Idaho

Toadstools "Grow" in Garden the Year 'Round

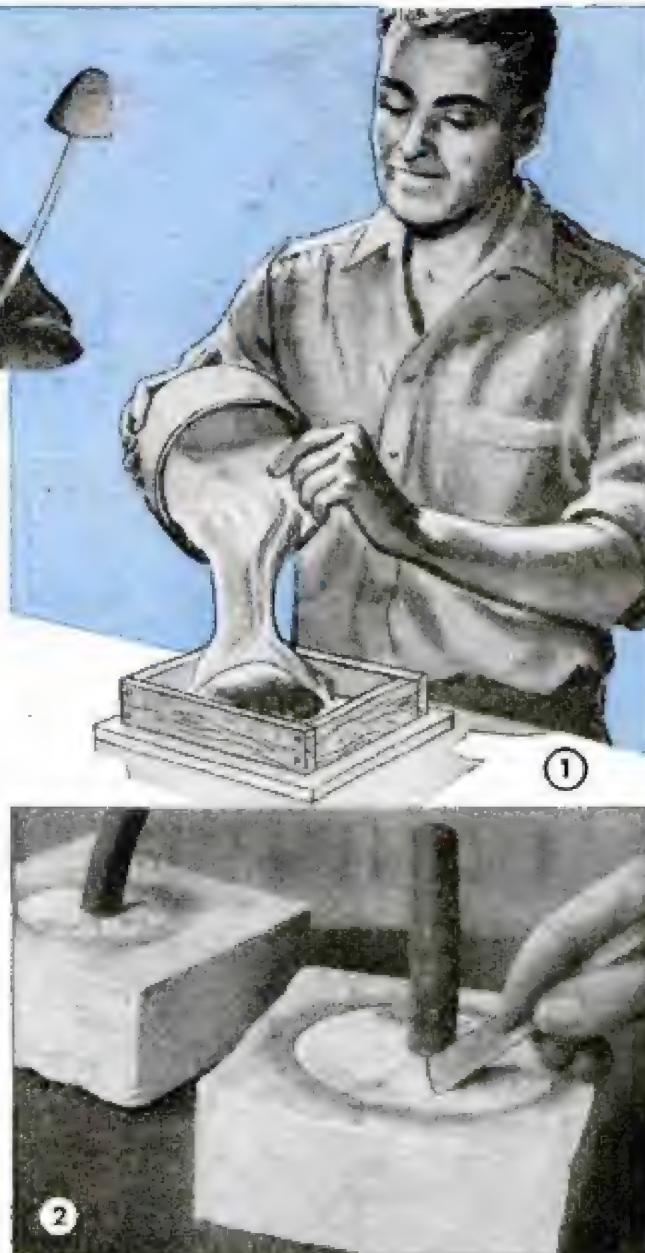


These "plants" are not affected by frost, snow or the change in seasons. If your garden arrangement changes from time to time you can transplant 'em anywhere. Durable, too, because they're cast in concrete of a special mix. First, you make a pattern of modeling clay, working the clay to the size and shape desired on a board. Use a live toadstool as a model. Then make a bottomless box about 2 in. larger each way than the overall size of the pattern. Place the box over the pattern board as in Fig. 1. Mix plaster of paris to the consistency of pancake batter and pour the box full as shown. Level the plaster carefully and allow it to harden. Then remove the box and the clay pattern and apply two coats of shellac to the plaster mold. Next, mix dry, 1 part fine clean sand, 3 parts portland cement and 2 parts plaster of paris. Add water to a quantity of the dry cement mix and stir until it is thin enough to pour easily. Coat the inside of the mold with light motor oil and pour it full, troweling the mixture to work out any air bubbles. Wire of various sizes in lengths of 6 to 10 in. is used for the stems of the smaller toadstools while iron pipe in the smaller diameters is used for the stems of the larger ones. Bend a hook shape in one end of the wire stems and insert the hook end in the center of the cast cement. Trowel around the wire stem, and then shape ribs on the underside of the casting as in Fig. 2, using a putty knife. After the cement sets, lift the casting out of the mold and submerge in water for 24 hours. Paint the underside of the casting a chrome yellow and the stem and the top of the casting a light cream color. While the paint is still wet blend in a small quantity of burnt umber, beginning at the center and working down to the edges.

Dick Hutchinson, Alhambra, Calif.

Removing Plant From Flowerpot

An easy way to remove a plant from a flowerpot without disturbing the roots is to insert a length of stiff wire through the hole in the bottom of the pot and rotate it

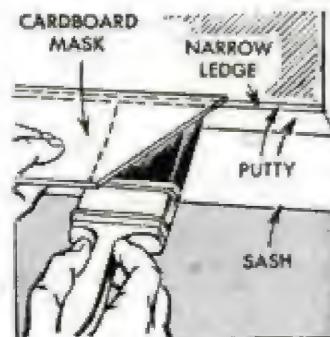


at a low angle to loosen the soil from the bottom. Then the soil at the sides of the pot is loosened with a knife blade and the plant is lifted out with the soil intact.

Robert Kane, Chicago

Quick Way to Paint Puttied Sash

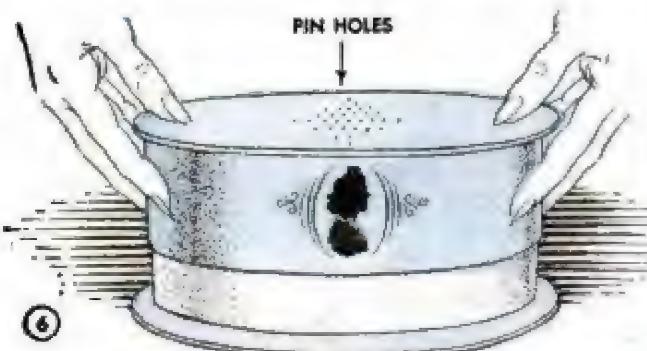
When putting around window sash, press a piece of tin along the upper edge of the putty to form a slight ledge. Later, when you paint the putty, the flattened surface thus formed will provide a good rest against which a cardboard mask can be held to keep paint off the glass window pane and thus speed the work considerably as well as make it easier.





Solving Home Problems

- 1 If it is impractical to use hooks when stringing a clothesline in your basement, C-clamps can be used for any number or arrangement of lines and they will not damage the joists
- 2 Spread over the labels of medicine bottles, a thin coat of colorless nail polish will protect the writing on the labels from damage by water and keep them clean and readable
- 3 Attach rubber washers to the bottom of the dishpan to avoid leaving black marks on the sink and drainboard. A waterproof glue, such as airplane cement, will hold the washers
- 4 Measuring tape glued to the inside of the wooden frame of a knitting bag is a convenience when measuring work. The tape should be given a coating of shellac for durability
- 5 There is no need to waste time looking for a misplaced cap when returning the milk bottle to the refrigerator; simply place an egg in the bottle mouth and the job is done
- 6 Because of the suction action, the lids on powder boxes and candy boxes are often hard to remove. If a number of pinholes are punched in the cover, the trouble is remedied

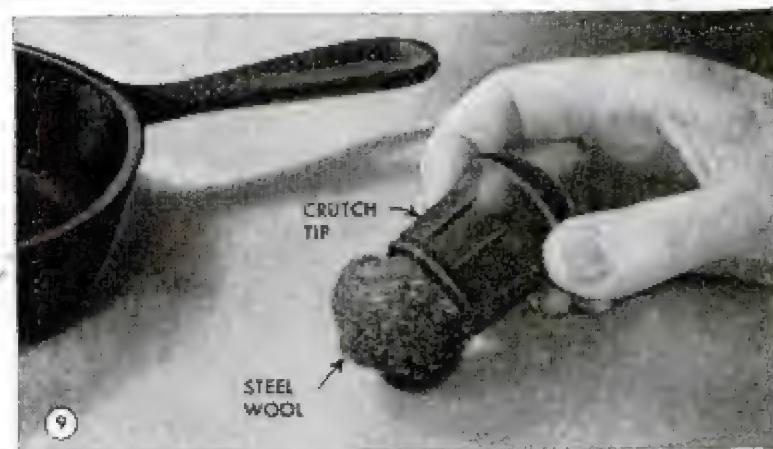




7 A child's plastic bank is a handy container for discarded razor blades. These banks come in a variety of shades so that one may be chosen to match the bathroom color scheme



8 An inexpensive lock pulley, such as is made for window shades, can be used to hold basement windows fully or partially open. The pulley is screwed to a joist near the window



9 As a safe container that will prevent scratching your hands, use a large crutch tip to hold a ball of steel wool. Most of the wool can be kept out of the way inside the crutch tip

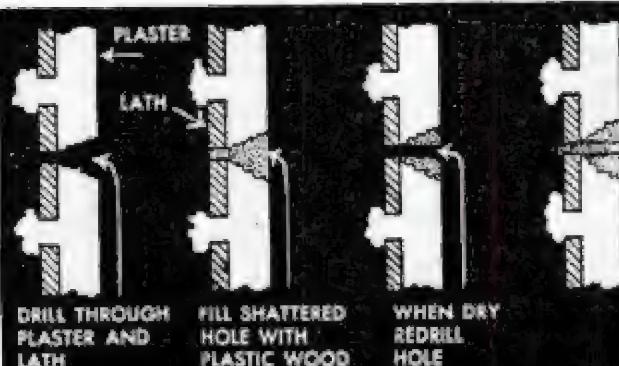
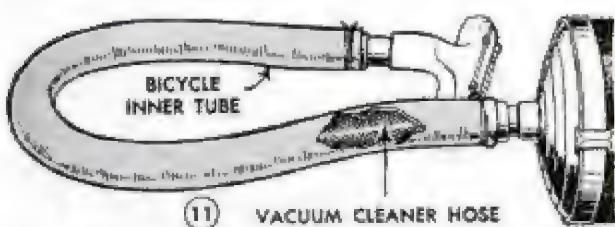


10 To simplify an otherwise difficult task, use a ball of putty to pick up bits of broken glass. If putty might stain the surface under the broken glass use wallpaper cleaner instead

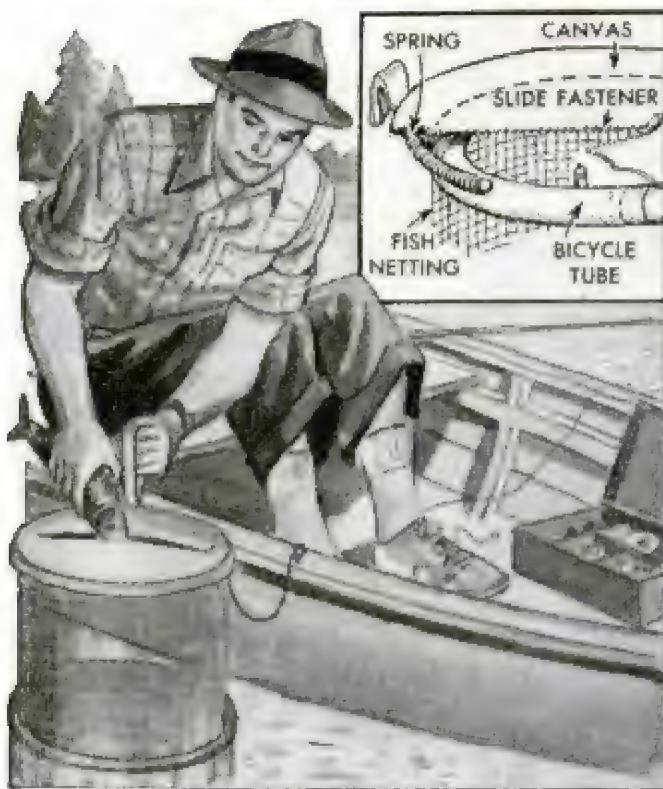


11 When a vacuum cleaner hose leaks so that loss of suction results, slip a discarded bicycle inner tube over the hose to stop the leak. Wire is wrapped around the tube at both ends

12 Ordinary plaster will not hold the screw hooks that are used in hanging pictures, but if a hole is drilled in the wall and filled with plastic wood, the hooks will stay in the wood

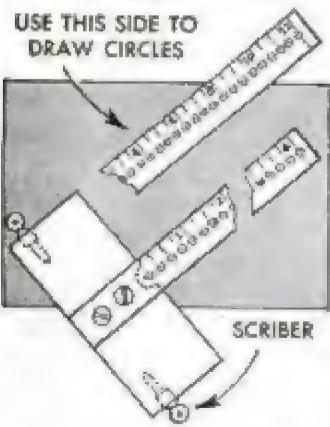


You Can "Bring 'Em Back Alive" In This Fish Tank



If you want to keep your fish alive until ready to start home, use a fish tank like this one. It collapses for easy storage and floats on the water when tied to the boat or pier. The tank consists of a round canvas top and bottom, in the hems of which are inserted screen-door springs to keep the tank shaped. The side walls are of fine-mesh fish netting. A slit at the top fitted with a slide fastener provides an opening for inserting or removing fish. An inflated bicycle inner tube cut down to size and attached to the tank at the top provides the necessary buoyancy to float the tank. When collapsed, the tank can be folded easily and carried in the pocket.

Marking Gauge and Circle Scriber



of the arm to be used as a marking gauge, starting with zero at the junction of the block and strip. Since the gauge must be turned over when scribing circles so that

the arm will lie flat, a scale also must be laid off on the other side. Then drill small holes through the strip at the desired intervals to take a scribe point. Scribes can be turned or filed from metal and carried in holes drilled in opposite ends of the head.

Charlie Gill, Shawinigan Falls, P. Q., Can.

Paper Can Be Made Transparent By Applying Cleaning Fluid

If you have no tracing paper on hand when you wish to trace a pattern or drawing, you can make ordinary paper transparent by coating it with cleaning fluid. A good way to apply the fluid is to use a stamp moistener of the type having a glass tube with a sponge-rubber applicator. The paper will become opaque again as soon as the fluid evaporates.

Dorothy Burgess, Portland, Ore.

W.T.M. Concrete Iron Pipe Laid in Concrete Floor To Provide Door Threshold

When laying concrete in doorways of garages, a $\frac{3}{4}$ -in. pipe provides a threshold that has no sharp edges or bulkiness to injure auto tires. Leveled properly and anchored to the door frame, the pipe will not bend when concrete is poured over it. It acts as a straightedge and guide for an even finish. The surface of the concrete inside the building should be almost flush with the pipe. On the outside it should be lower, slightly above the longitudinal center of the pipe and sloped downward to provide a watershed. Less than half of the pipe should be exposed to be sure of proper anchoring. The threshold will serve either overhead or hinged doors.

Michael Ligocki, Gary, Ind.



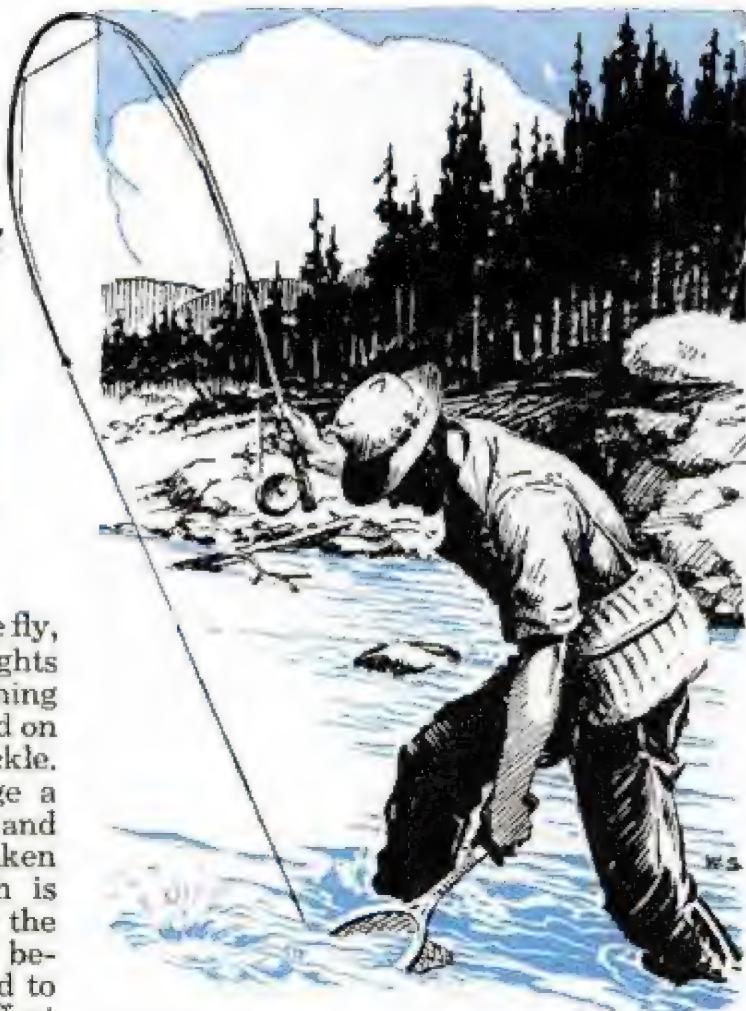
How To Recondition Bamboo Rods

By Robert Page Lincoln

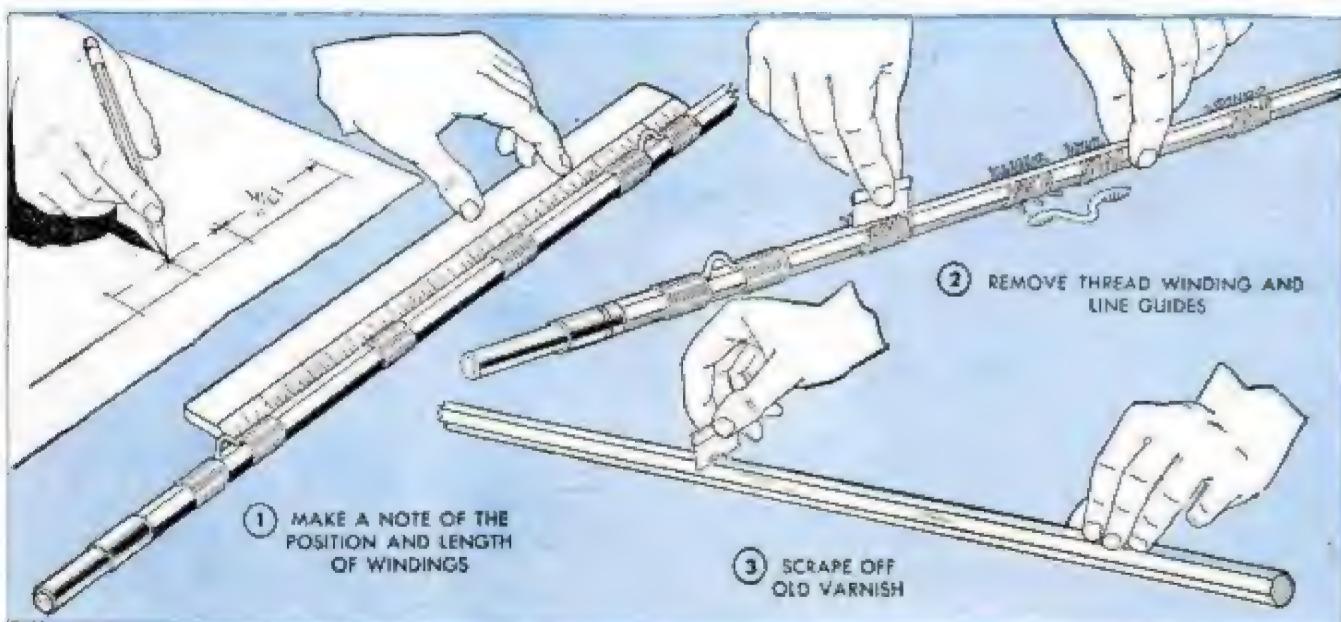
WHEN fighting trout or bass take the fly, or when the deep-sea heavyweights hit the lure, from there on out everything depends on your skill as a fisherman and on the strength and reliability of your tackle.

After several seasons of hard usage a bamboo rod may appear rather shabby and unkempt. Perhaps the tip section has taken a "set" or bend; likely the varnish is chipped or cracked badly, and probably the guides are worn and the windings are beginning to fray at the edges. If allowed to go without repair these defects will affect the efficiency of the rod.

The first thing to do in refinishing a rod is to make detailed notes of the position of the windings and guides as in Fig. 1. Note also the width and color of the windings. Then cut through the thread with a sharp razor blade as in Fig. 2. Usually the old varnish can be removed quite easily by scraping with either a razor blade or a sharp knife as in Fig. 3 but be careful not to round the corners of the hexagon section or to cut any deeper than the varnish coating. Don't use a varnish remover; however, nail-polish remover can be used

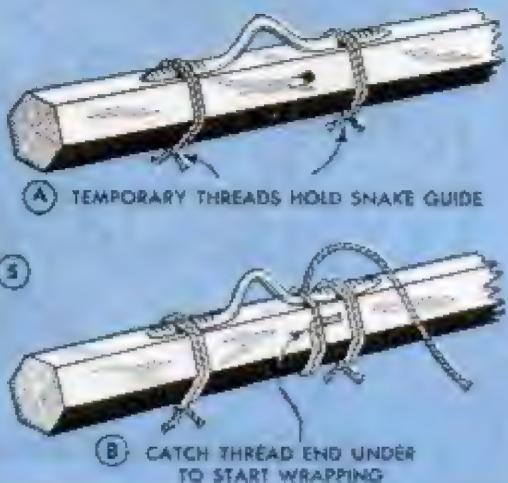


very sparingly to clean off what remains of the varnish, after a thorough, careful scraping. If the ferrules are loose, remove them as in Fig. 6. Then scrape off the old cement, melt new cement, which comes in stick form, and apply in an even coating. Force the ferrule back in place, Fig. 9, and give it a quarter turn to spread the adhesive uniformly. Wipe off all surplus which may be forced out. Sometimes on old rods the bamboo segments will be separated at places along the length, especially near the ferrules. Treat this condition as in Figs. 7 and 8, and be sure to allow plenty of time





Making the

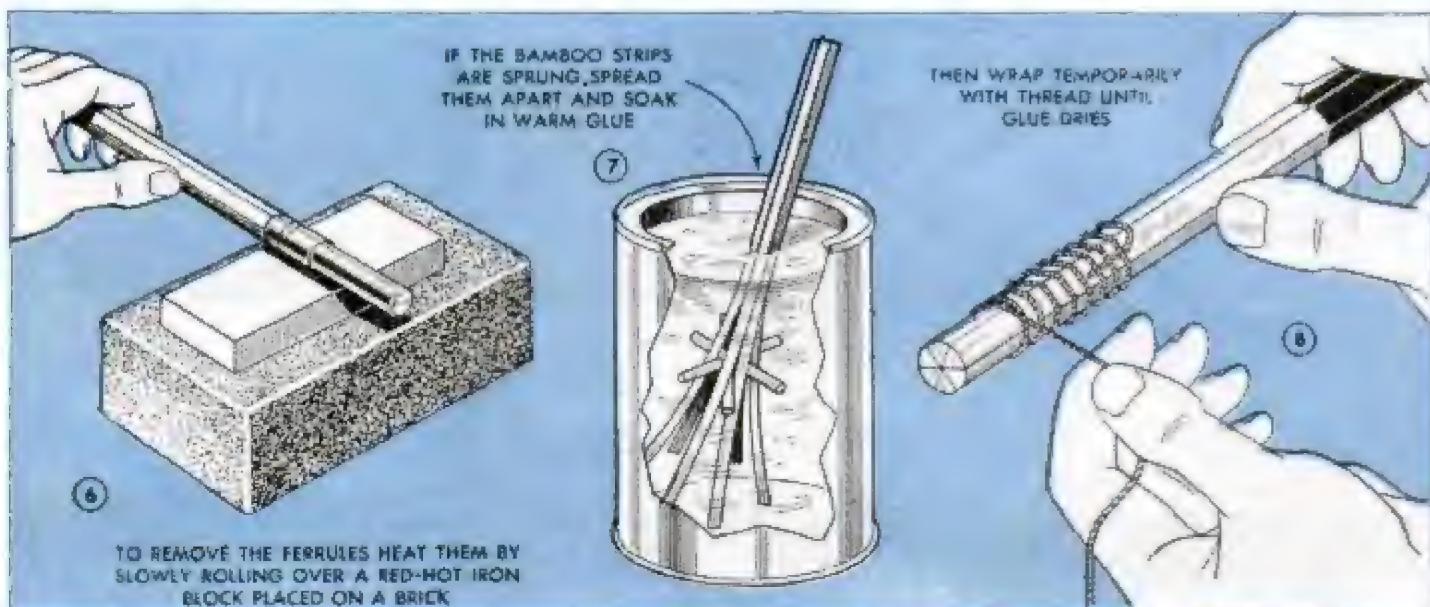


for the glue to dry before unwinding the "clamping" thread. Wipe off surplus glue with a damp cloth before it dries. In this operation, it's important that the segments fit true, otherwise that section of the rod may show up a bend or "kink" which will affect its usefulness.

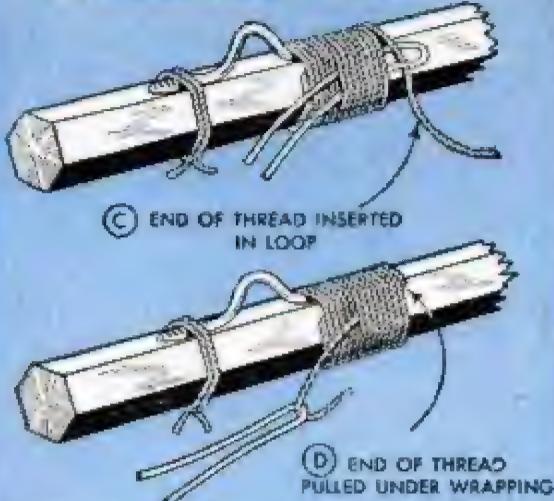
Now's the time to make sure that the ferrules fit properly. Often old ferrules tend to stick due to accumulated dirt and corrosion of the sliding surfaces. A buffing wheel will polish the parts to a velvety fit, but you have to be careful that the metal is not heated to the point where the cement will be softened. Badly roughened or corroded ferrules will have to be smoothed with very fine emery or "crocus" cloth, Fig. 11, before buffing. It's necessary to be careful that you don't polish away the metal to the point where the parts fit loosely. With the work completed to this stage, check the location of the guides from the reference sketch previously made as in Fig. 1, and mark lightly on the rod the position of each. If there is a set or bend in either or both of the rod tips—most fly rods are provided with two

tips—the bend can be worked out by gently straightening the tip against the original set, using both hands. This takes a bit of patience, but the method is effective. Another way is to hang the tip from the ceiling with a weight attached to the lower end. Guides should be replaced on the underside of the bend. Many rods are fitted with the so-called "snake" guides, and any of these that show undue wear or other damage should be replaced with new parts. This also is particularly true of the reel guide and the tip-top guide. If these are worn or grooved they will damage the line.

Fig. 5, details A to D inclusive, shows how to tie an invisible knot when making the new windings. First give the rod a thinned coat of special rod varnish and allow this to dry thoroughly. You'll note in Fig. 4 an arrangement for maintaining a uniform tension on the thread when making the windings, the thread being pulled through a music clip attached to a standard. Jaws of the clip should be smoothed so that they do not tear the strands of the silk thread. Use the same color and size of thread as the

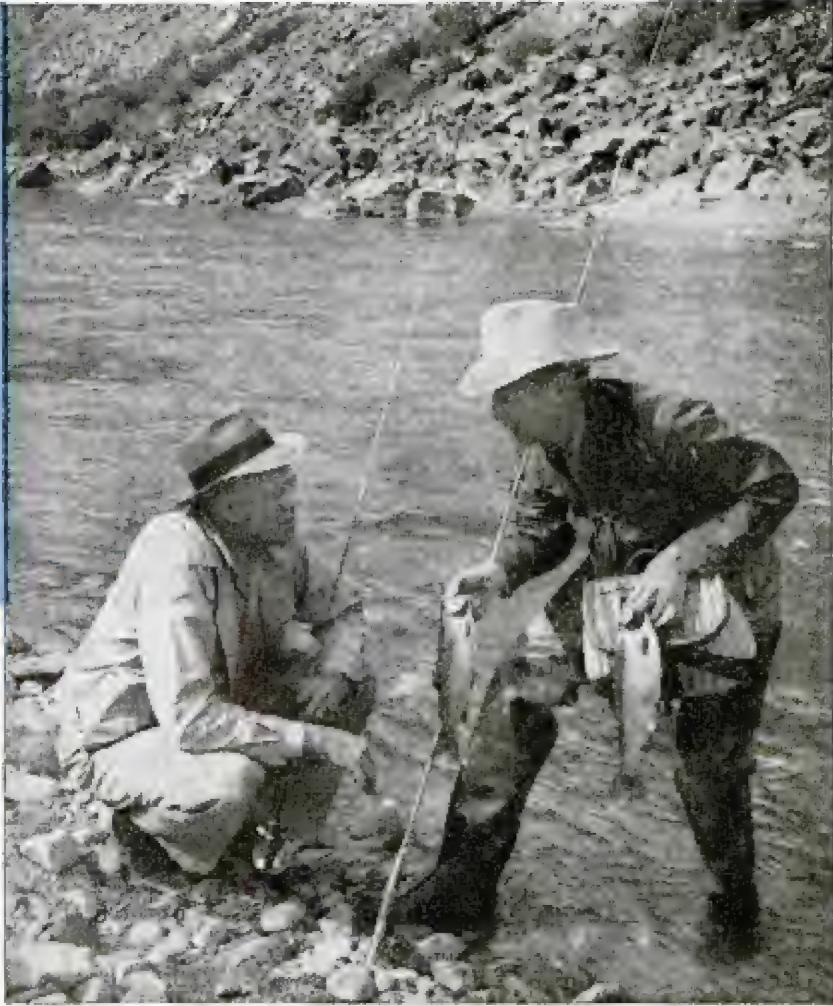


Invisible Knot

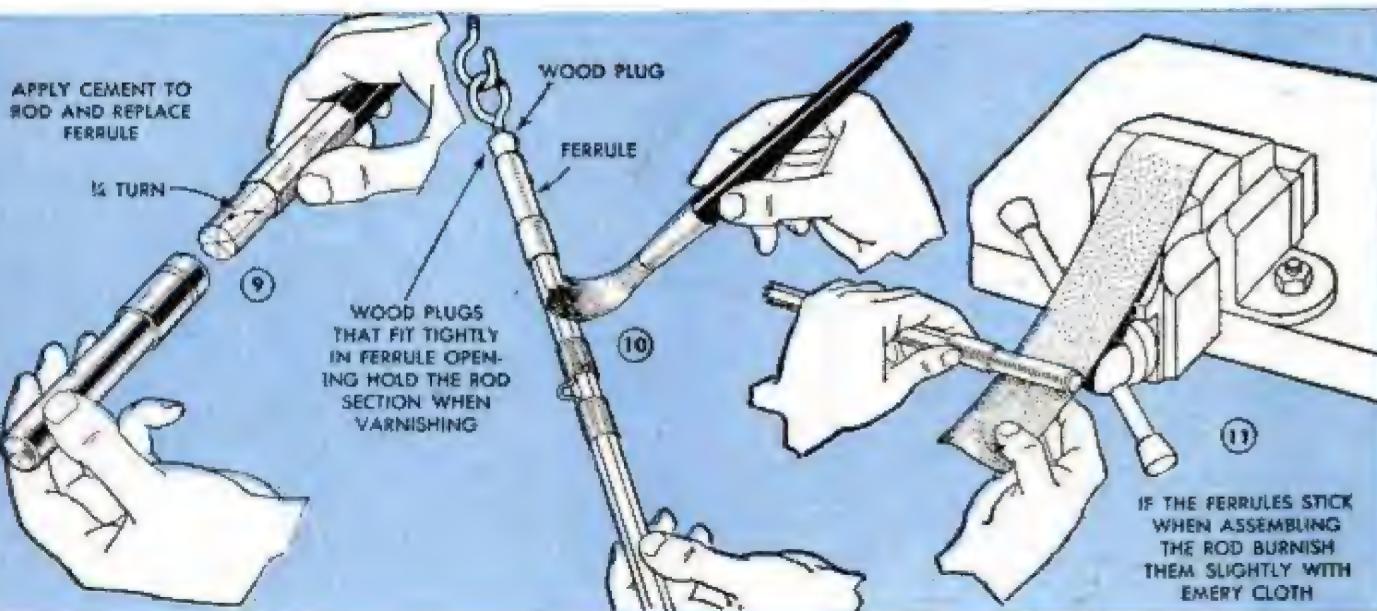


original windings. It should be remembered that the windings add "tension" to the rod and that's why it's important to duplicate the position of the originals. Although the number of turns may vary, 25 turns per winding is a good average. Some refinishers space in an extra winding to stiffen an old rod, but usually this is not necessary.

Apply thinned white shellac to the windings and when dry follow with several coats of clear collodion or a special silk-thread color preservative. Use your finger for these applications as a brush picks up too much of the finishing material. Follow with three to five coats of rod varnish applied with a small brush as in Fig. 10. Hang the sections of the rod by fitting a wood plug and screw eye in the ferrules. Allow the varnish to dry several days between coats. Rub down the last coat with fine pumice stone and water and finish with dry rotten-stone rubbed with chamois. If you wish to



produce an exceptionally fine finish rub down each coat after a thorough drying, using pumice stone only. This leaves the surface slightly rough so that succeeding coats will bond properly. However, the principal purpose of rubbing down each coat is to level the varnish to a film of uniform thickness. After each rubbing clean the rod thoroughly with a damp rag and allow to dry before applying fresh varnish. When not in use the rod should be kept in a case to protect it from breakage, scratches or other damage. A tubular metal case is generally preferable to a cloth one.



Carrying Case for Small Cameras Utilizes Tobacco Pouch

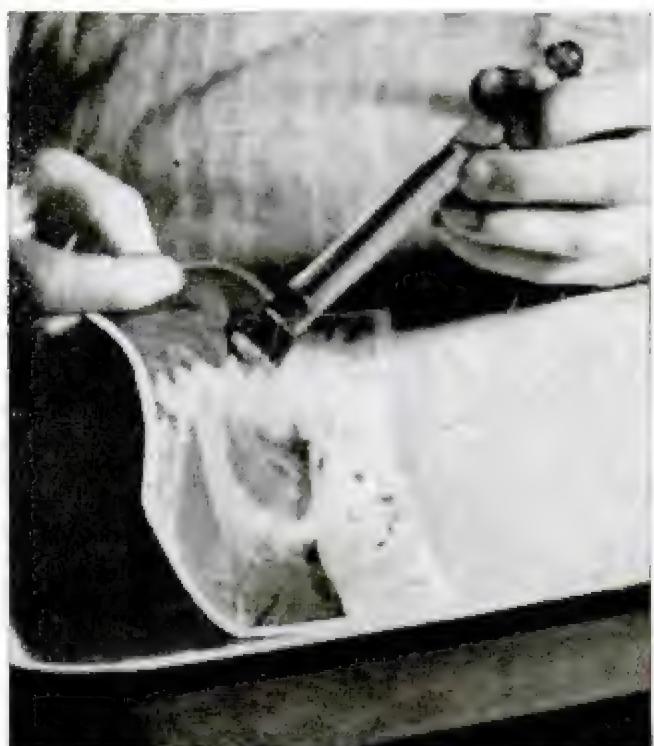


An ordinary tobacco pouch, lined with soft flannel cloth, may be used as a convenient camera case for smaller cameras. Such a case can be carried in a pocket as it eliminates the bulk typical of stiff leather cases.

H. Leeper, Canton, Ohio

Applicator for Warm Developer

Occasionally a photographer will have a contrasty print in which a particular area is so dense that it comes up too slowly in



the developer to bring out the wanted detail. If warm developer is applied to the area with an applicator used to moisten stamps and envelopes, a print may be saved that otherwise would be discarded.

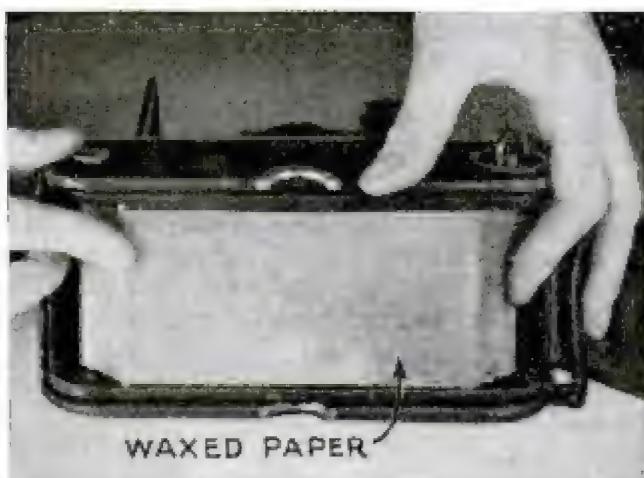
Identifying Paper in Darkroom

As a precaution against placing the cover of one box of printing paper on the box of a different grade of paper and thus confusing the grades, mark the grade number of each type of paper on the bottom of the box. A black crayon mark is easily seen in the red or amber light of the darkroom.

Henry P. Cesary, Syracuse, N. Y.

Paper Is Used as Ground Glass To Check Focus

Not all cameras have a ground glass screen to check the bed scale on the camera. However, if the back of the camera is removed and waxed paper is threaded over the film spools, this will serve as a ground glass. To test, open the lens and measure to objects that are the same distance from the



camera as the gradations on the scale. Each measured object should be in sharp focus on the screen when the camera is set for the corresponding distance.

Tape Mends Camera Bellows

A camera bellows with cracks or pinholes can be mended effectively with cloth-mending tape. The bellows is opened fully so the creases are flattened and the tape is applied to the inner surface over the hole to be patched. Then a small block of wood is pressed against the tape and a moderately warm soldering iron is rubbed on the outside of the bellows over the hole. The tape will adhere to the cloth and prevent further leaking of light. To test the bellows after such repair, a lighted flashlight is held inside the camera in a darkened room.

J. Buford Gooch, Key West, Fla.

THE PICTURE MEANS MORE— *when you do your own developing*

By Fred G. Korth

ALTHOUGH you can have your negatives developed by photo finishers, there is a satisfaction that comes from doing your own work, as well as knowledge gained that will enable you to take better pictures. Developing is interesting, the chemicals are inexpensive and the required darkroom space is available in almost every home.

To begin, the room that is used must pass a much more rigid test than a room that is used only for printing and enlarging. Seal all windows and doors with cardboard and tape, blankets or by any other means available. Then spend about 6 min. in the room. If, at the end of that period, you can detect a white ceiling or a white piece of paper near a window, the room is not dark enough for the processing of modern panchromatic film. If any cracks show or if a slight amount of light is allowed to filter into the room, the film will be fogged.

Various tray and tank developments are available, their suitability being determined by the type of negative being processed. However, since roll film, cut film and film pack all can be developed in trays, this procedure will be explained first. Three trays are needed, one for the developer, one for the rinse and one for the fixing solution. This type of tray is shown in Fig. 4. The chemicals to use are those recommended by the film manufacturer. If your camera takes very small negatives that are enlarged to more than four diameters, fine-grain developer in solution is better. Otherwise ordinary powder developer can be used.

When developing roll film, it should be made as flexible as possible before bringing it into contact with chemicals. This is done by removing the paper from the roll, fastening a clip to each end of the film and immersing it in clear water at the same temperature as all of the chemical solutions, 65 to 72 F. After the film has been softened, it is immersed in the developer and moved slowly





3



4



5



6

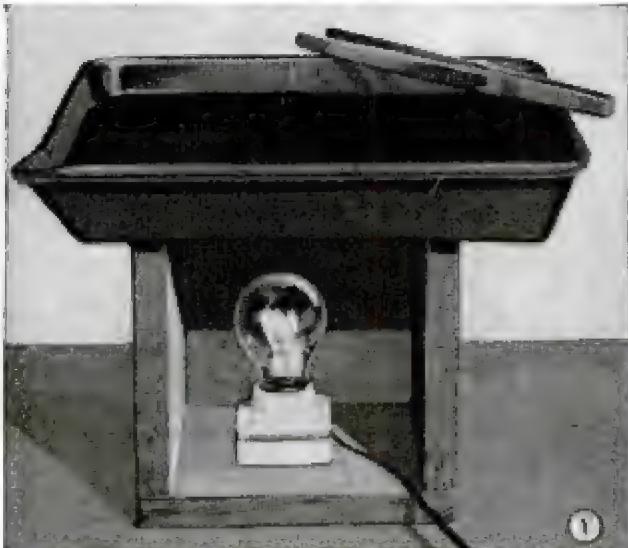
and evenly through the tray with a see-saw motion, Fig. 4. Keep the emulsion side up. Usually the makers of film and developer give the length of developing time, which should be followed closely, but if a wide range of time is given, for example 3 to 5 min., it may be better to stay on the short side, say 3½ min. Note that fine-grain developers may require up to 20 min. or more. For every 3 degrees above the recommended developing temperature, the time should be decreased 10 to 15 per cent, but do not allow the temperature to rise above 75 F. In all cases the specific instructions of the manufacturer should be followed. A darkroom or kitchen timer with a nonluminous dial can be used for accurate work.

When the time of development is over, the film is taken to the center tray, which contains water, and rinsed for about a minute. It then is moved to the fixing bath, or acid hypo, where it remains for about 15 min. After 4 min. it should be fixed sufficiently for inspection with light. An alternate method of developing roll film is to use the type of tank illustrated in Fig. 3. First practice loading the film in daylight, using film that has been processed. Learn to handle the film so it does not buckle and be sure not to touch the emulsion.

After the fixing is complete, suspend the film in running water, Fig. 5, for about 30 to 40 min. A bathtub is ideal for this purpose. When the washing is done, hang the film on a string with a clip and use an almost dry sponge or chamois to remove most of the moisture from the film, Fig. 1. Care must be exercised because the emulsion is very soft and will scratch easily. Leave the film hanging to dry in a dust-free room with fair ventilation.

Cut film and film pack are developed best in tanks similar to those shown in Fig. 2. The same timing and temperature rules that apply to roll film apply equally well to these types of films. Likewise, when developing the film, it is necessary that the negative be moved in the solution. Cut film is held in a hanger and may remain there until ready for drying. Both types are held in wooden clips for drying as shown in Fig. 6.

Print Developer Kept at Proper Temperature



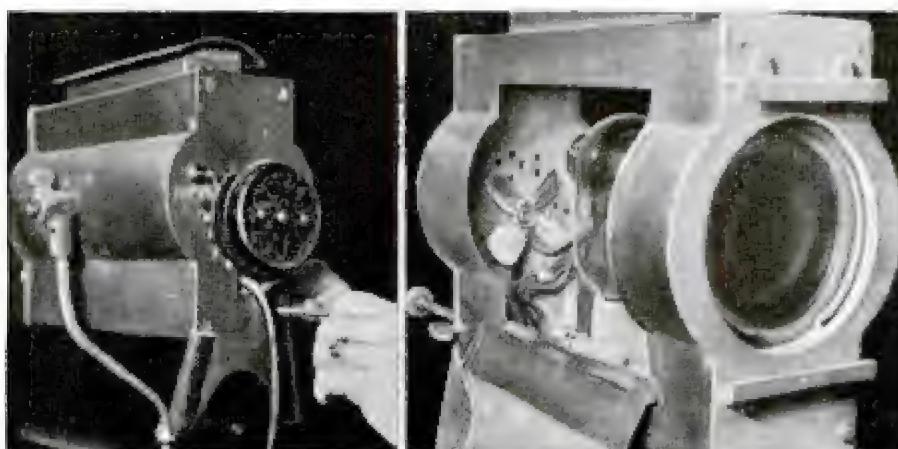
Some means of correcting and holding the proper temperature for print developers is needed in most home darkrooms. Where hot and cold water are not available, an ordinary lamp mounted in a three-sided box as in Fig. 1 can be used to regulate the temperature. Probably some experimenting will be necessary to determine the proper size of lamp to use. In some cases it may be desirable to enclose the open front of the box with a hinged door. With hot and cold water at hand one method that usually is satisfactory is placing the developer tray inside a larger tray. Cold or warm water then is added to the outside tray as needed. Where necessary, ice cubes can be used for cooling as in Fig. 2.



Electric Fan Mounted on Spotlight Housing Cools Lamp

Heat generated by a spotlight or a floodlight can be dissipated if a small fan is installed in the light housing to force cooling air over the bulb and thus increase the efficiency and safety of the lamp. The fan and motor from a car heater, with a few alterations, will adapt itself to this job if the proper power is available. A better solution, however, would be to use a motor that

will run on standard current and fit it with a fan. The motor should be mounted on extension brackets so that it will not block the free flow of air into the housing by being too close to the vent holes. Small strips of flat iron can be bent and drilled to form brackets which attach to the motor and the light housing with self-tapping sheet-metal screws. It may be necessary also to add an extension to the shaft since the standard for motors of this size is fairly short. As a safety precaution, to be sure that the fan is running when the light is on, wire the motor in parallel with the light switch. This cannot be done, of course, if there is a separate source of power for the fan. — Lyn Grover, Los Angeles, Calif.



CRAFT QUIZ



1. Work on this galvanized iron box is—
 (a) Hard soldering (c) Brazing
 (b) Soft soldering (d) Silver soldering



2. Before jointing you should look at—
 (a) Face grain (c) Rear table
 (b) End grain (d) Motor



3. This molding is—
 (a) Ogee (c) Oval
 (b) Scotia (d) Beaded



4. The tool being ground is a—
 (a) Parting tool (c) Skew chisel
 (b) Gauge (d) Beading tool



5. For sake of safety he should use a—
 (a) Pinchbar (c) Compass
 (b) Push stick (d) Dado saw



6. You can tell he knows about—
 (a) Fluting (c) Post blocking
 (b) Skiving (d) Taper turning



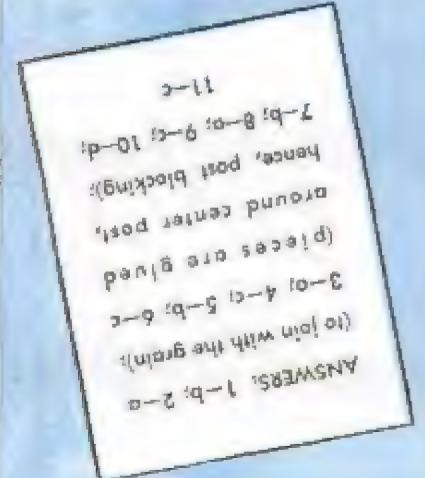
7. This model maker is working with—
 (a) Lag screws (c) Bolt clippers
 (b) Carving tools (d) Escutcheons



8. Circular saw is being used for—
 (a) Cove cutting (c) Molding
 (b) Ovaling (d) Hollowing



9. Work is being done with a—
 (a) Draw knife (c) Spoke shave
 (b) Veneer scraper (d) Router



10. He is using a—
 (a) Crab stretcher (c) Tack claw
 (b) Seam presser (d) Webbing stretcher



11. Operator is cutting a—
 (a) Bead (c) Dado
 (b) Dentil (d) Dovetail

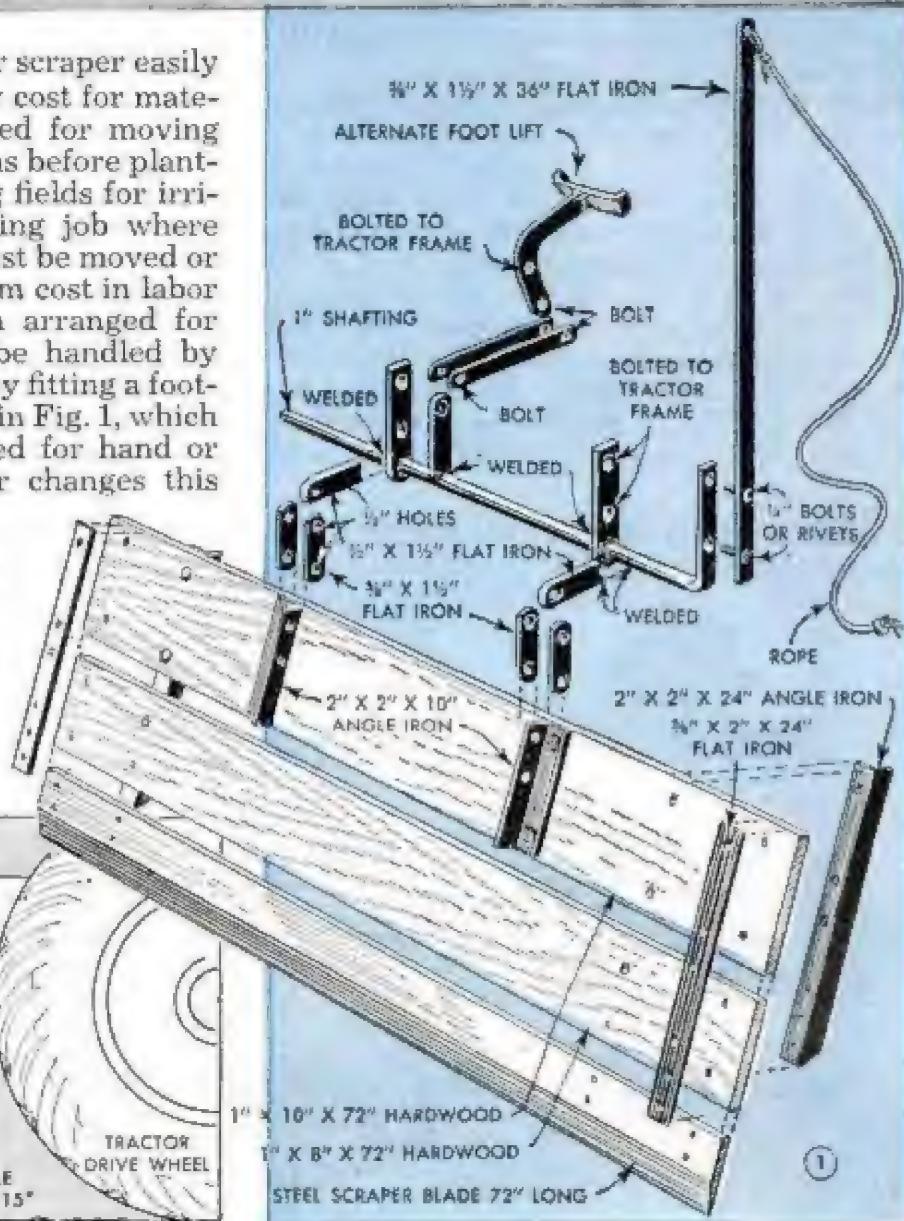
TRACTOR SCRAPER

made in farm shop



YOU can make this tractor scraper easily in your farm shop at low cost for materials. It's especially designed for moving loose soil, leveling large areas before planting, light grading, preparing fields for irrigation—any leveling or filling job where loose dirt, gravel or sand must be moved or leveled quickly at a minimum cost in labor and time. Although shown arranged for two-man operation it can be handled by one man on occasional jobs by fitting a foot-lift mechanism as suggested in Fig. 1, which shows a lift linkage designed for hand or foot operation. With minor changes this linkage can be fitted to most tractors of cultivating height and having side-mounting frames.

Fig. 1 also shows the assembly of the scraper body, which consists of a steel scraper blade and two hardwood boards held in place



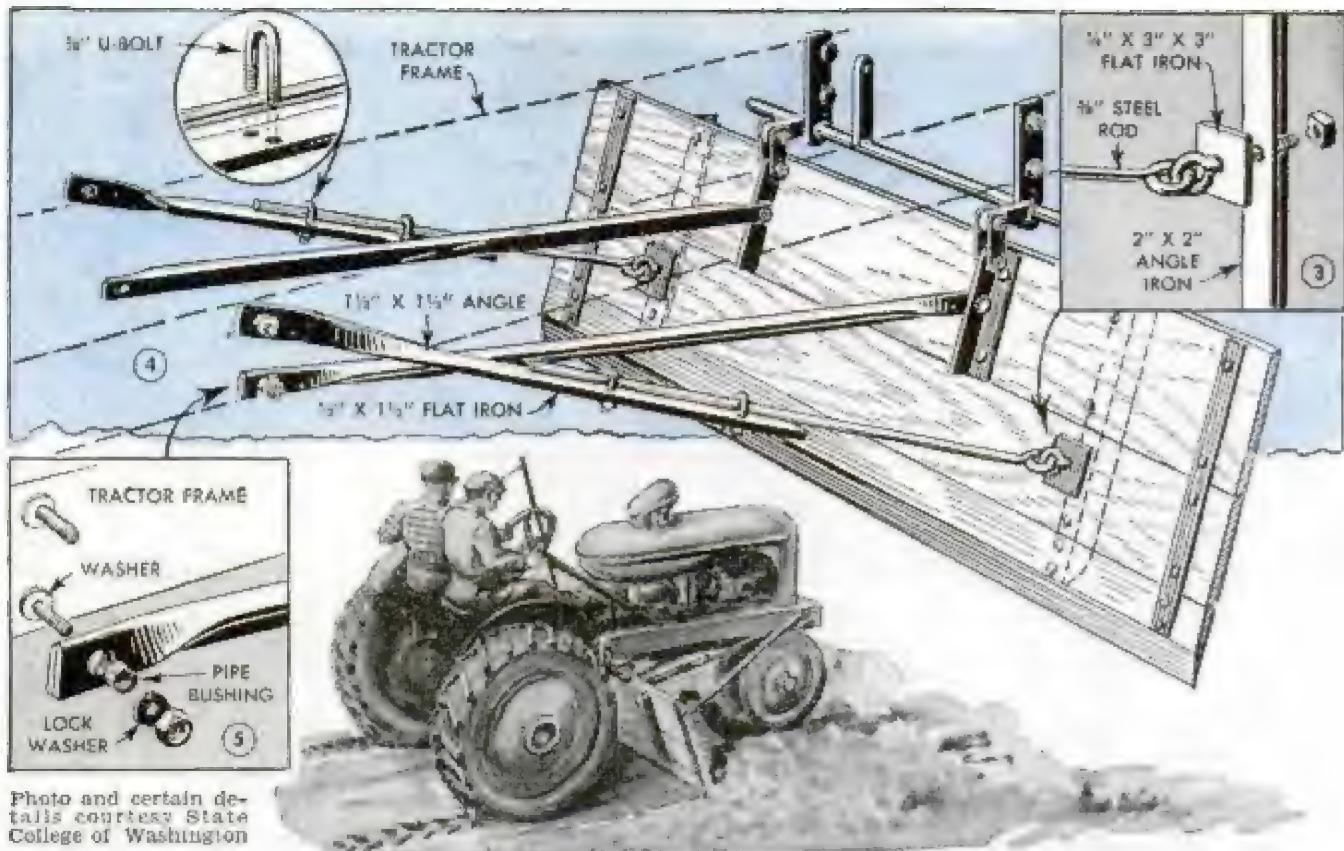


Photo and certain details courtesy State College of Washington

with angle-iron "cleats." This construction serves the purpose on most jobs and greatly reduces the weight, thereby making the implement easier to handle. Start with the scraper body and assemble it before cutting any other parts to size. Place the scraper under the tractor on a concrete floor or other level surface and block it securely at an angle of about 15 deg. as in Fig. 2. Be sure to get the assembled scraper blade centered under the tractor. With the blade thus in working position you can determine the exact length of the parts of the lift linkage, Fig. 1, and the dual drawbars, Fig. 4. Dimensions of these parts have been

purposely omitted as these measurements must be taken direct from the tractor on which the scraper is to be mounted. Ordinarily the lift linkage should be so assembled as to give a lift of about 3 in. above the ground when the tractor is on the level, Fig. 2. Of course, a higher lift can be arranged if desired. On some tractors it may be necessary to make the scraper body of a lesser height than indicated in order to allow room for the higher lift. Figs. 3 and 5 show how the drawbars are attached to the scraper and the tractor frame. Use lock washers under all nuts so that parts do not jar loose.

Flares Are Improvised From Cans and Thin-Wall Tubing



One contractor, suddenly having need for a large number of road flares, found that he could improvise them from cans and thin-wall tubing. Half-gallon syrup or lard pails are used. The tubing is cut so that it is 1 in. longer than the height of the can. Then wicks are inserted in the tubes and the tubes, in turn, are set in the cans which are filled with coarse sand. Fuel oil is poured into the sand, thoroughly saturating it, and the torches are ready for use. In addition to acting as a carrying agent and reservoir for the oil, the sand also serves to weight the flares and give them stability so that they do not tip or blow over in a high wind.

Switch on Electrode Holder Decreases Line Load

In almost any welding shop and especially on construction jobs there are intervals when the welding machine continues to run without actual welding being done. At such times the load on the primary line to the machine can be lessened considerably by breaking the excitation current to the shunt fields of the generator by means of a button or other pressure-type switch on the electrode-holder handle as shown in the detail. The saving on a 300-ampere welding machine amounts to approximately 6 amperes at 220 volts. Moreover, this arrangement renders both the holder and rod "dead" when not in the hands of the operator, thus preventing any accidental "short" which might be produced between the rod and the work or ground. On any of the self or externally excited motor-generator sets the switch may be attached by disconnecting the rheostat from one terminal and connecting a wire from the rheostat to the switch on the electrode holder. Then connect another wire of equal length to the other terminal of the switch and lead this back to the rheostat terminal as shown in the detail. Any ordinary rubber-covered wire of No. 14 ga. will do since the amperage carried in this circuit is relatively low.

The wires are taped to the welding line at intervals as shown. Any type of toggle or push button switch may be used as long as



it has a carrying capacity of 6 amperes at 120 volts.

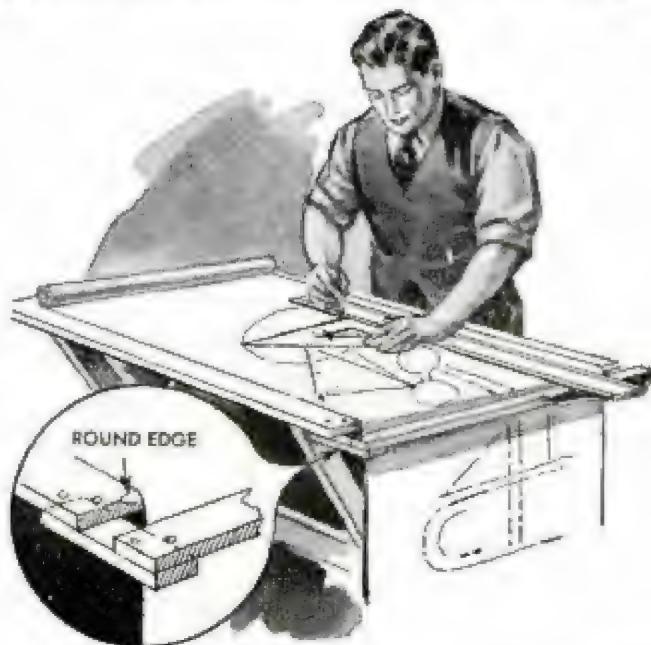
Wm. R. Lewis, San Francisco, Calif.

Drafting Board Has False Edge to Handle Long Tracings

By attaching an extension edge to a drawing board with blocks at the corners, tracings of any length may be fastened to the board and not interfere with the use of the T-square which rests against the false edge. The corner of the edge of the board should be rounded so the tracing paper will slide over it easily and the false edge should be planed perfectly straight. A 2-in. piece of hardwood is most satisfactory for this purpose.

Removable Poultry-House Roosts

Poultry roosts can be removed for cleaning and put up again quickly if they are fitted with storm-sash hangers. The hanger hook is screwed to the poultry-house wall and the eye is attached to the roost to hold it.—Charles Swope, Danville, Pa.



Walk Is Built of Concrete Blocks Without Preliminary Fill



Here is a walk of concrete blocks that is laid quickly with a minimum of effort. The blocks are placed as indicated and a board is driven into every other hole for a tight fit. The wood used should be creosoted or treated with some similar preservative. Because of the cracks separating the blocks, water will drain from the surface and the walk can be laid either on leveled ground or in a trench.

Shop Drawers to Hold Small Parts Made From Baking Pans

Waste space beneath a shelf can be put to use by installing drawers made from small baking pans. Cut and rabbet wood strips so that, when they are fastened to the underside of a shelf, they form grooves in which the projecting edges of the pans slide. Make all these pieces the same length

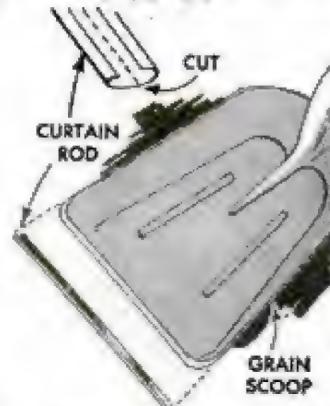


and nail another strip across the ends to act as a stop for the pans. No handles or knobs are needed on the pans since they are easily grasped with the fingers. One way of labeling the drawers is to slip a lettered card under the end folds of the metal. Another is to solder or otherwise fasten to the end of each drawer a sample of the contents which are contained in the drawer.

Walter E. Burton, Akron, Ohio

Lip on Scoop Prevents Splintering

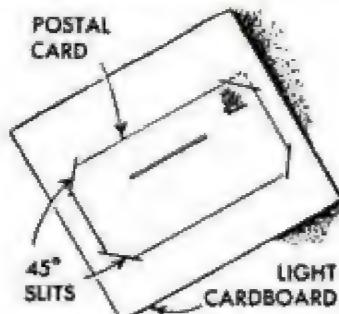
In order to avoid digging splinters of wood from a granary floor, fit the leading edge of the grain scoop with a section cut from a flat curtain rod. Cut it lengthwise into halves and shorten it to the width of the scoop. After fitting the rod in place, lay the scoop on a solid metal surface and peen the lip to a tight fit with a hammer.



Postal Card Holder Aids Typist

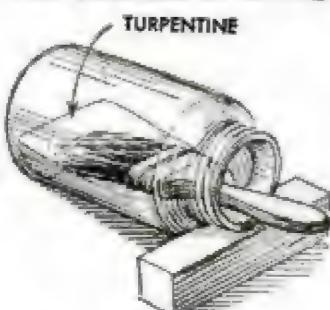
To keep postal cards straight in a typewriter and to utilize the full space on the card, as cannot be done ordinarily, one typist slit a larger sheet of light cardboard with 45-deg. corner cuts. The postal card is inserted in this holder, which in turn is fed into the typewriter like a regular sheet of paper.

James D. Callahan, Lincoln, Nebr.



Brush Is Soaked in Tilted Jar

To minimize the amount of turpentine needed to soak a paintbrush, support a glass jar on a block of wood, as shown, and lay the brush inside the jar. Only enough turpentine to cover the bristles is necessary. This method will save one half to one third the quantity of turpentine required as compared with an upright jar.
—D. J. Bachner, Jackson Heights, N. Y.

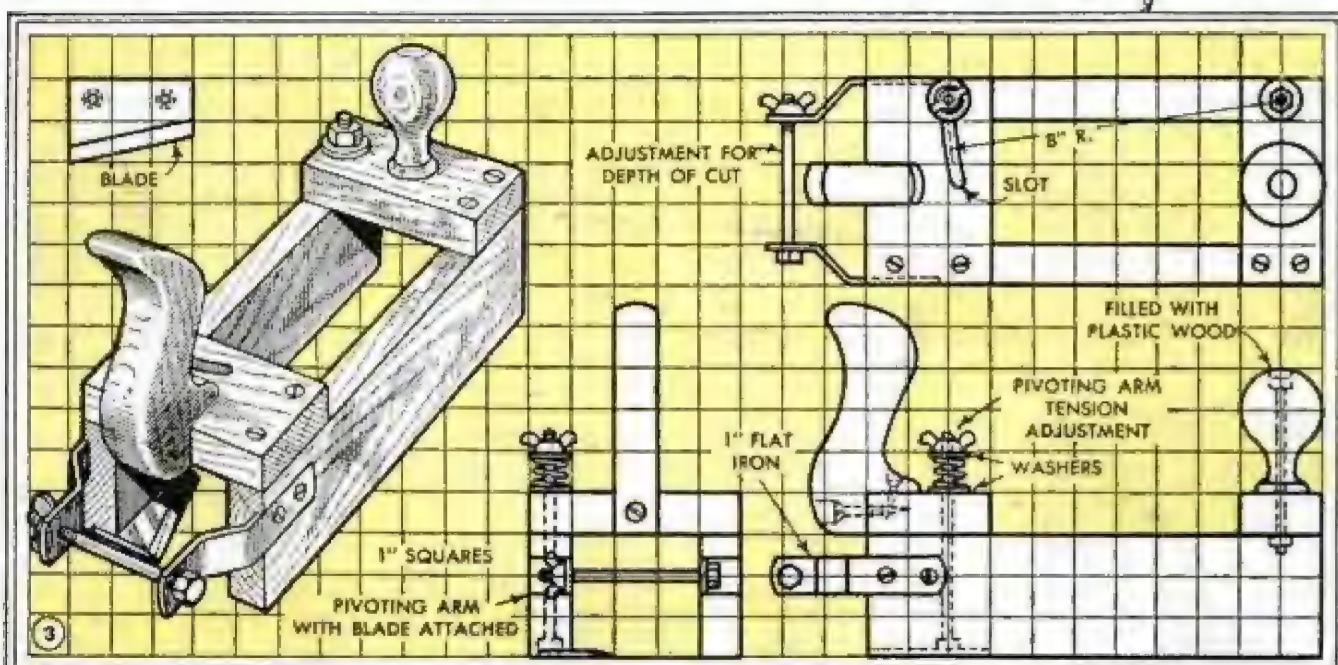
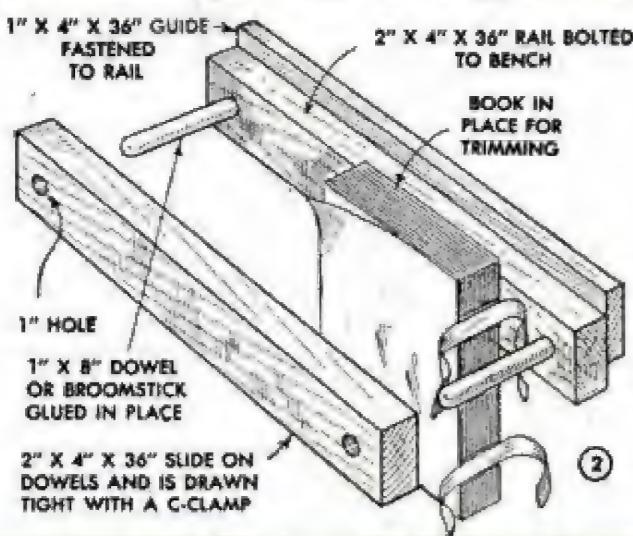
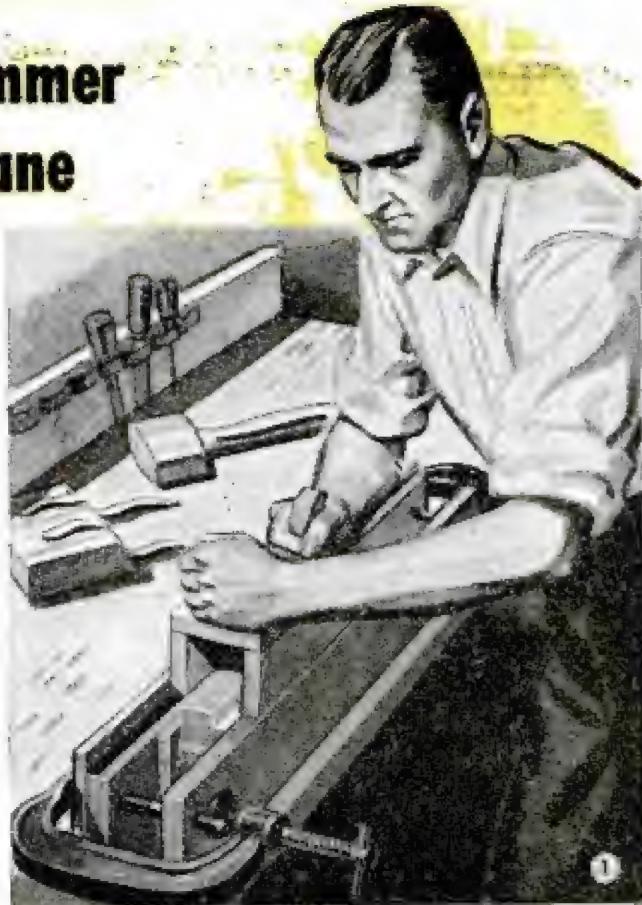


Bookbinder's Paper Trimmer Used Like a Hand Plane

Continued from page 216

Here's a solution to the inexperienced bookbinder's greatest problem, that of neatly trimming the book after stitching. This trimmer consists of two principal parts, one a clamp for holding the work as in Figs. 1 and 2 and the other a "plane," Fig. 3, fitted with a special shearing blade so mounted that it can be swung on a radius for making successive cuts. One jaw of the clamp, Fig. 2, bolts to the edge of a table or bench top and the movable jaw slides on hardwood guide pins. Clamping pressure is supplied by C-clamps, one at each end of the jaws. The plane should be made of hardwood for durability. The shearing blade, Fig. 3, can be shaped from an old plane iron or any flat steel which will hold a sharp edge. The blade is attached to the pivoted arm by a bolt fitted with a spring tension adjustment as shown. A second bolt passing through flat-iron arms attached to the rear of the plane body provides adjustment for depth of cut. When the setup is made as in Fig. 1, the stitched book is clamped in place with the amount to be trimmed projecting above the top of the clamp jaws. The blade trims flush so it is necessary to be quite particular in making this setting. The plane bears against a guide strip attached to the fixed jaw and the cutter is adjusted to shear 4 to 6 thicknesses of paper at each stroke. A greater depth of cut might cause tearing. Of course, the cutter must be reground and rehoned to a razor edge frequently to produce a neat, smooth job.

William A. Lawrence, Chattanooga, Tenn.



Liquids Poured Without Spilling By Keeping Can Spout at Top



When pouring liquids from five and ten-gallon oilcans and similar containers, there will be less spillage if the can is held so the opening is at the top instead of at the bottom, as is the usual practice. This is especially true when the can is almost full because the spout will be in position before the liquid starts to flow.

B. J. Klassen, Goessel, Kans.

Feed Water Test Indicates Oil

To test for oil in boiler water, draw off a sample into a clean test tube. With your thumb over the mouth of the tube, shake the sample vigorously for several minutes. If, after you have stopped shaking the tube, there is an accumulation of bubbles on the surface, the presence of oil in fairly large amounts is indicated.

W. F. Schaphorst, Newark, N. J.

Eyeglass Case Holds Micrometer



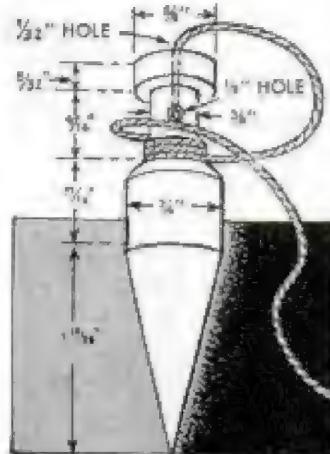
A leather-covered metal eyeglass case can be used to carry a 1-in. micrometer and thread gauge. To hold the micrometer in place, a small block is screwed to the

bottom of the case. The eyeglass case keeps this precision tool free from oil, grit and, most important, from dust. If an old eyeglass case is used for this purpose be sure to give it a thorough cleaning.

Plumb Bob Has Reel for Line

The line on a plumb bob will always be neatly wound if you use a bob like this one, which has a reel turned on it for winding the line. It is made from a piece of stainless steel or Monel metal. After turning the bob to the size and shape indicated, the upper end is drilled lengthwise for a distance of about $\frac{1}{2}$ in. and then cross-drilled to break through the center hole. The line is threaded through the two holes and then knotted to keep it in place.

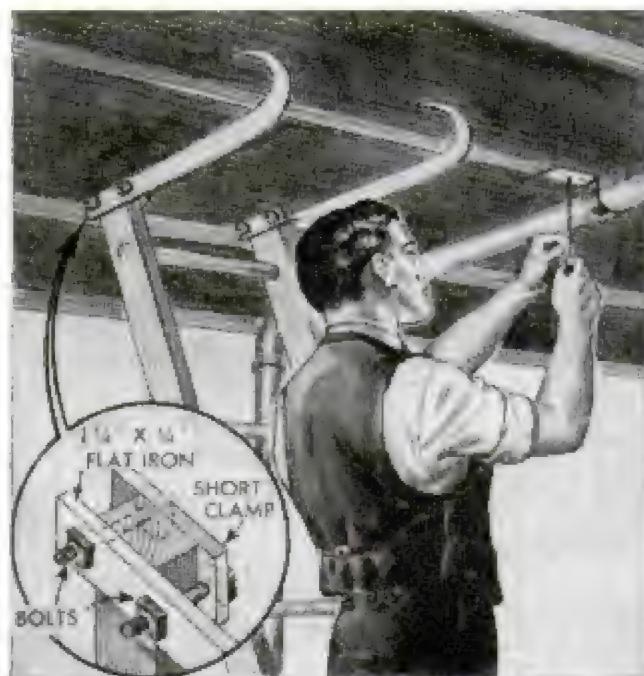
Christopher McEvoy, Mobile, Ala.



Ladder Anchored With Grapples To Make It Secure

Grapples attached to a ladder will prevent its slipping sideways and will also allow you to place the ladder at an angle so you can work in cramped spaces directly overhead. The hooks are lengths of flat iron cut to shape and attached to the upper end of the ladder rails with bolts. Rigidity is provided by having the bolts fasten to a short clamp on the other side of the rail.

A. P. Teed, Jackson, Mich.



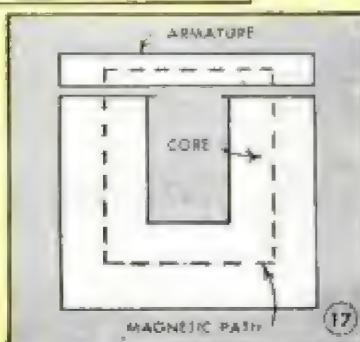
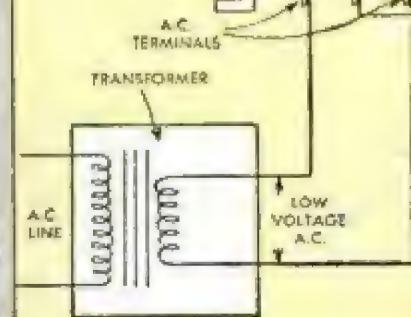
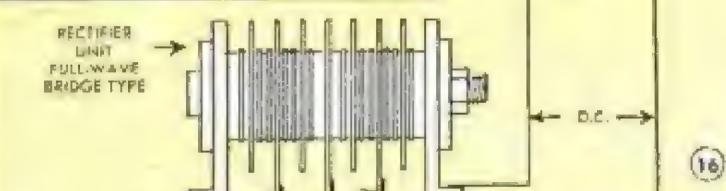
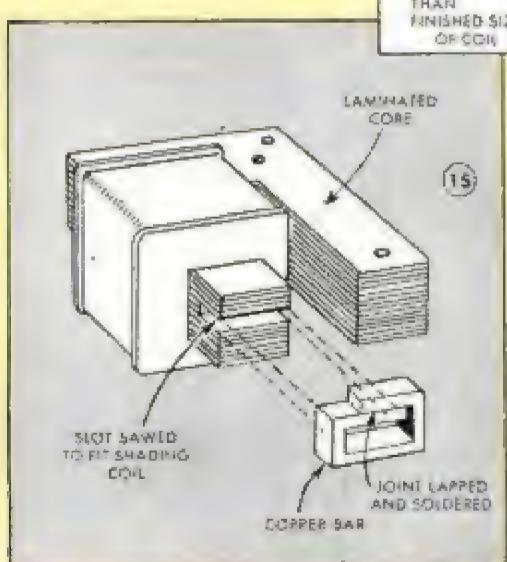
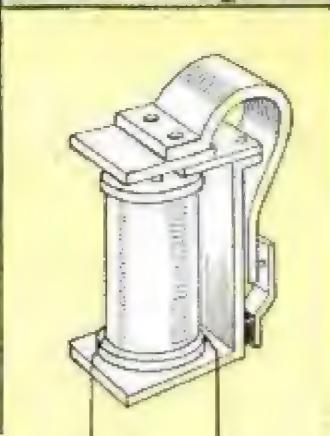
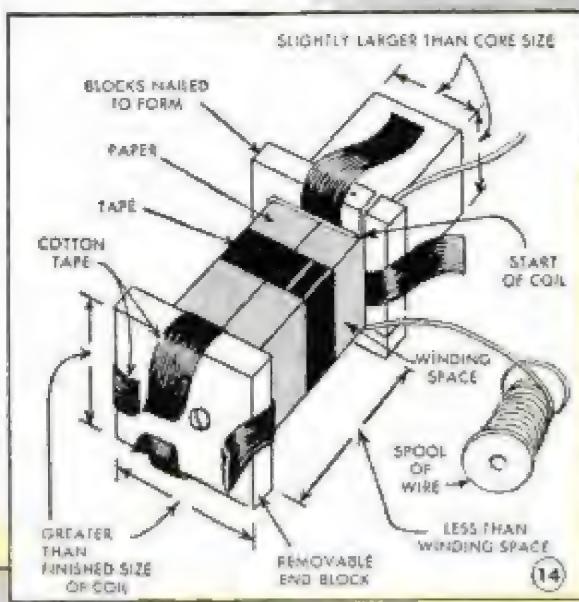
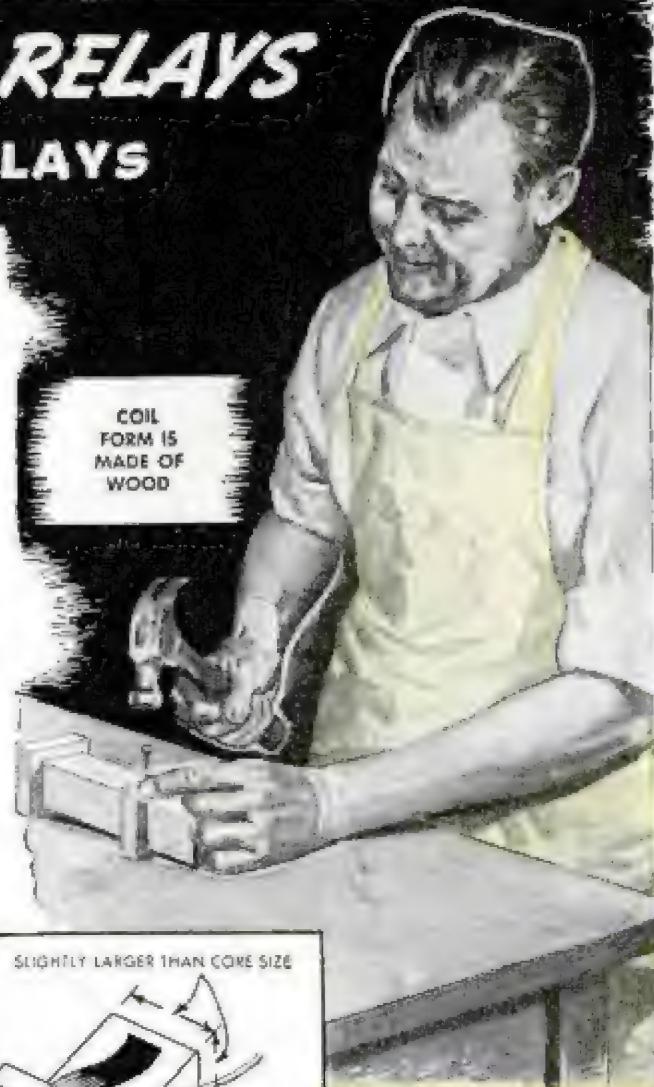
Build Your Own RELAYS

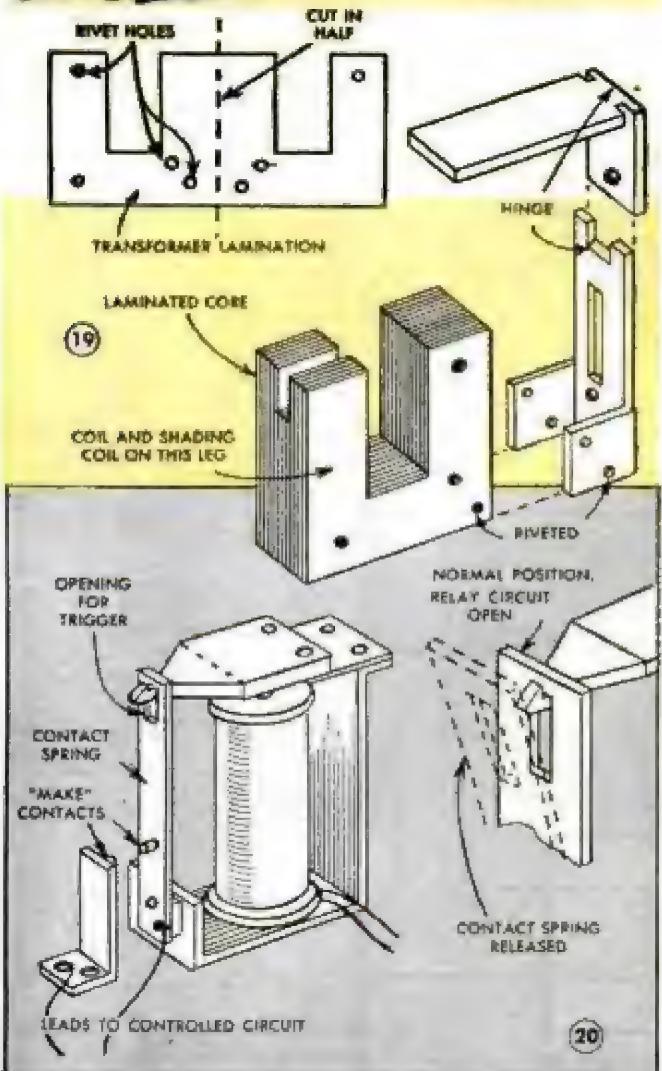
PART 2-A.C. RELAYS

By C. A. Crowley

RELAYS made according to instructions given in Part I will not operate satisfactorily on alternating current. However, with minor changes in design, they can be made to operate on a.c. if they are connected in series with a dry-disk rectifier, as shown in Fig. 16. In such cases, the relay must not be operated at a.c. voltages higher than the rating of the rectifier used. Since that is usually less than the line voltage, the relay must be operated with low voltage from a transformer. To design a relay to operate on rectified a.c., it is necessary to calculate the pull and ampere turns as for a d.c. magnet. Then divide the ampere turns by the a.c. voltage and multiply by 1.35 to get the design factor. This design factor can be used in the same way as for a d.c. relay to determine the wire size from the chart, Fig. 21. The coil then can be wound as described in Part I.

If the relay is to be operated continuously, frequently, or on a voltage of more than 25, it is best to use a coil wound on a laminated core. A





laminated core taken from an old radio transformer will be suitable but will require some alteration. The laminations can be sawed in half as in Fig. 19 to make a U-shaped core. The number of turns required to wind the coil for 60-cycle current can be found by multiplying the voltage by 4.7 and dividing by the winding-core area. For example, if the core is $\frac{1}{2}$ in. thick and $\frac{1}{2}$ in. wide, the core area is 0.25 sq. in., and to operate the relay on 110 volts a.c. will require 110 multiplied by 4.7 divided by 0.25 or 2070 turns.

On 25-cycle current, the number of turns is equal to 11.3 times the voltage, divided by the winding-core area. The wire size can be calculated by measuring the magnetic path, indicated in Fig. 17, dividing by the number of turns and multiplying by 50,000. This gives the required wire size in circular mils. Assuming that the magnetic path measures 4.25 in., the wire size required is 4.25 divided by 2070 multiplied by 50,000, or 103 circular mils. The corresponding gauge number can be found by referring to the chart, Fig. 21. Here you can see that the closest size to 103 circular mils is No. 30 wire, which has a cross-sectional area of 101 circular mils. Using this wire size, which is only a little smaller than the calculated size, will slightly reduce the pull of the relay and also will reduce its operating temperature. Since a slight reduction in pull will be satisfactory in this case, the relay can be wound with No. 30 wire. If the next larger size of wire above the calculated value is used, the pull of the relay will be increased, which is not necessary, and the relay also will heat more, which is undesirable.

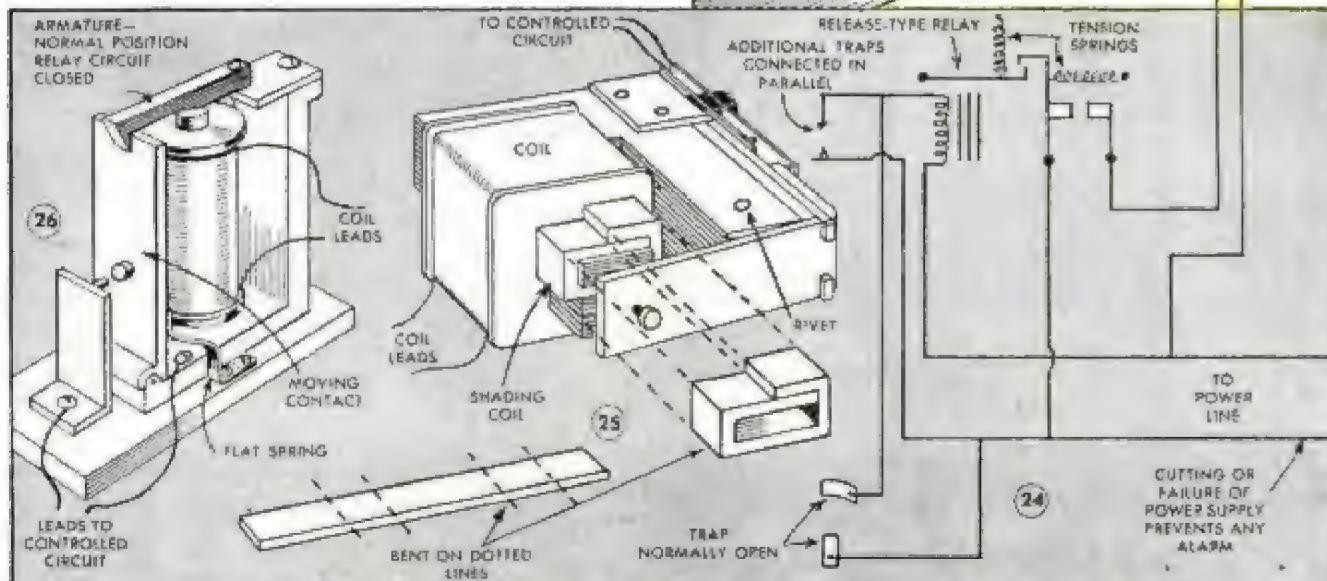
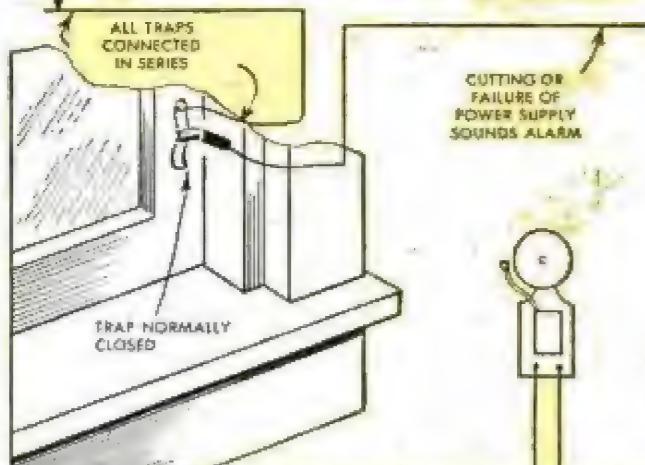
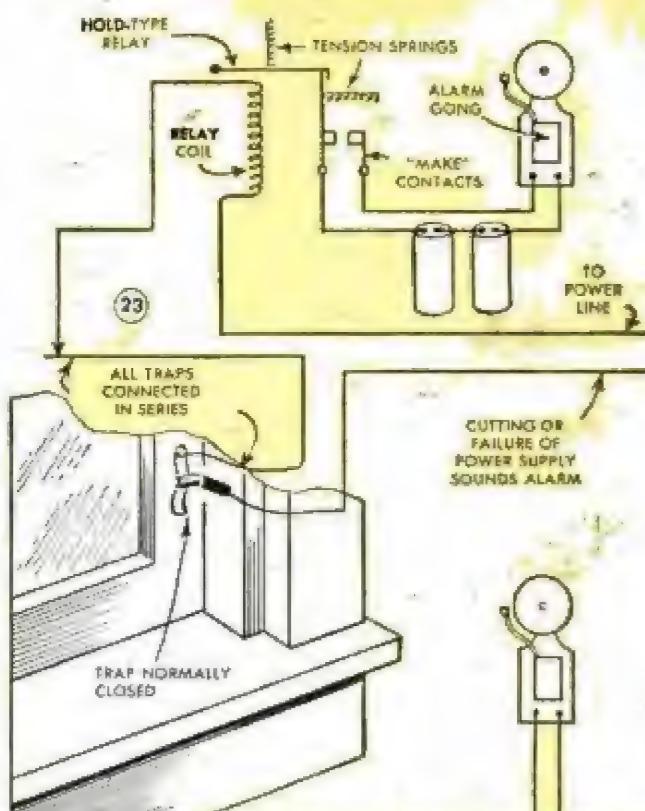
The coil can be wound directly on the core if desired, using essentially the same method as for a d.c. relay coil. However, due to the shape of the laminated core, it will be necessary to wind the coil on the

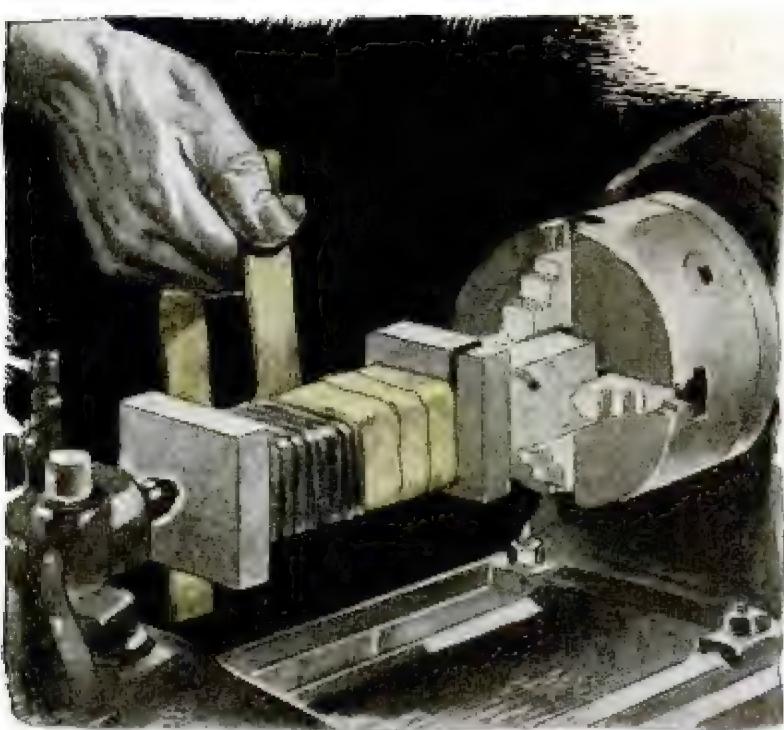
(21) WIRE SIZE AND GAUGE NUMBERS

B & S Gauge	Area (Circular Mils)	B & S Gauge	Area (Circular Mils)
10	10380.	24	404.
11	8234.	25	320.
12	6530.	26	254.
13	5178.	27	202.
14	4107.	28	160.
15	3257.	29	127.
16	2583.	30	101.
17	2048.	31	80.
18	1624.	32	63.
19	1288.	33	50.
20	1022.	34	40.
21	810.	35	32.
22	642.	36	25.
23	510.		

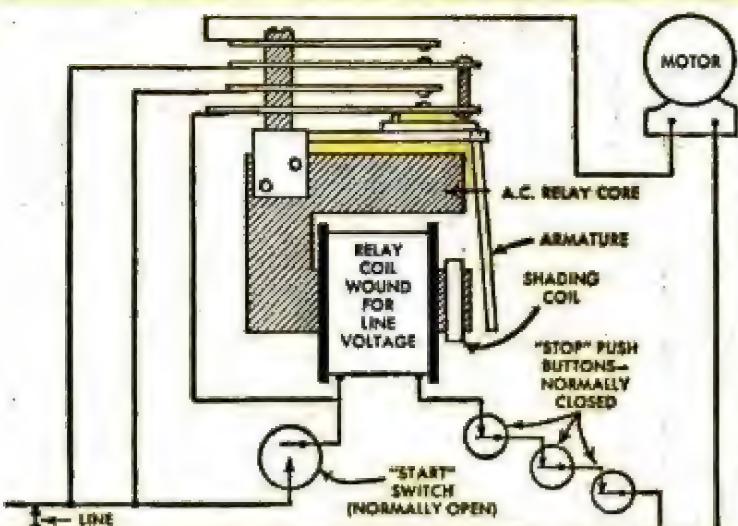
bottom of the "U." Another method is to wind the coil on a form and then slip it onto one of the arms of the core. In this case, the form should be constructed as shown in Fig. 14, about $\frac{1}{16}$ in. larger each way than the core on which the coil will be fitted, and with the winding space between the end blocks slightly shorter than the space for the coil on the relay core. The form should be long enough to be held in the hand, Fig. 22, or in a lathe, Fig. 18, while winding. Small blocks are nailed to the form at the proper place, leaving a slight space between two of the blocks for the start end of the coil. The end block is attached with screws for easy removal, and the form is tapered slightly toward that end so that the finished coil can be slipped off the form without binding. Four pieces of plain cotton tape then are placed lengthwise in the winding space, and a strip of brown paper is wrapped two or three times around the form, Fig. 14. It is held in place by a band of friction tape. The coil is wound to the required number of turns in tight, even layers. After each layer of windings is finished, a layer of brown paper should be wrapped around the coil as additional insulation, Fig. 27. If space is lacking, use a layer of brown paper over every second or third layer of wire. When the required number of turns has been wound, the ends of the cotton tape are brought together over the coil and tied tightly. After removing the end block from the form, the coil can be slipped off and placed in correct position on the core.

The shading coil, shown in Figs. 15 and 24, is very important, as without this an a.c. relay will hum. The shading coil can be installed by sawing a slot in one of the poles of the magnet, Fig. 30, and inserting a flat copper bar. This is looped around the laminations, Fig. 25, and the ends of the bar are lapped and soldered together. Un-

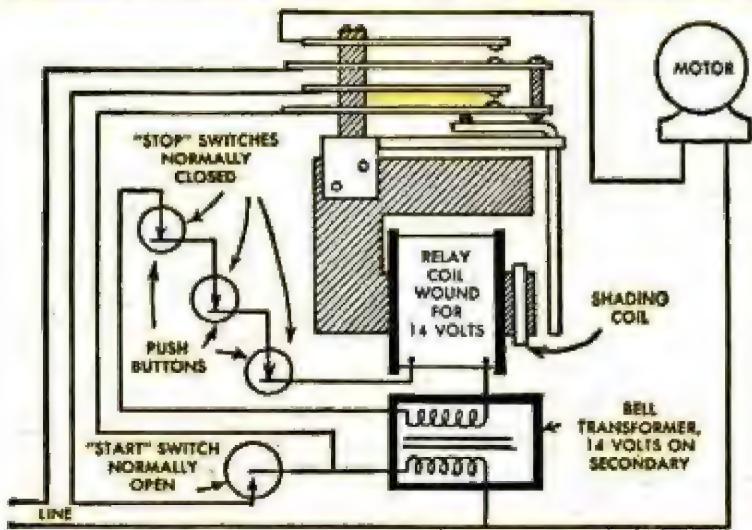




(27) EACH LAYER OF WINDING WRAPPED WITH BROWN PAPER



(28) SAFETY MOTOR RELAY



(29) LOW-VOLTAGE MOTOR RELAY

less the joint is lapped and soldered, the shading coil will not perform its function properly.

The armature of the relay can consist of a piece of flat iron of suitable dimensions, hinged as shown in Fig. 19 or in some other convenient way. Other methods of armature attachment were given in Part I. The armature can be used to operate spring contacts in the same way as shown for d.c. relays in Part I. A.c. relays offer the advantage of convenience of power supply and, if properly designed and built, can be made to operate satisfactorily.

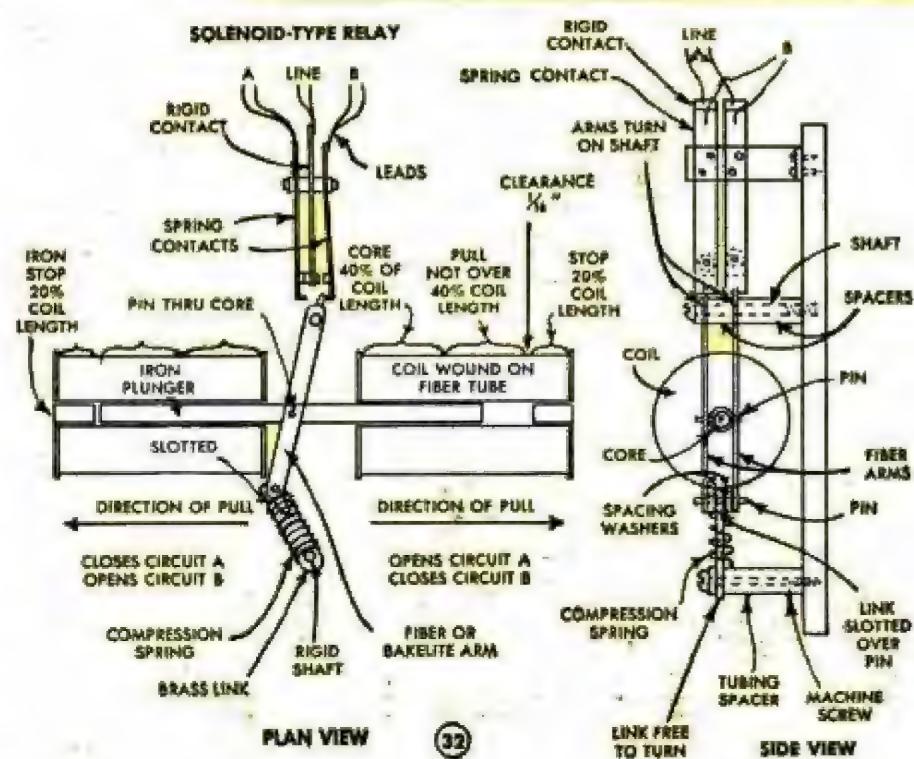
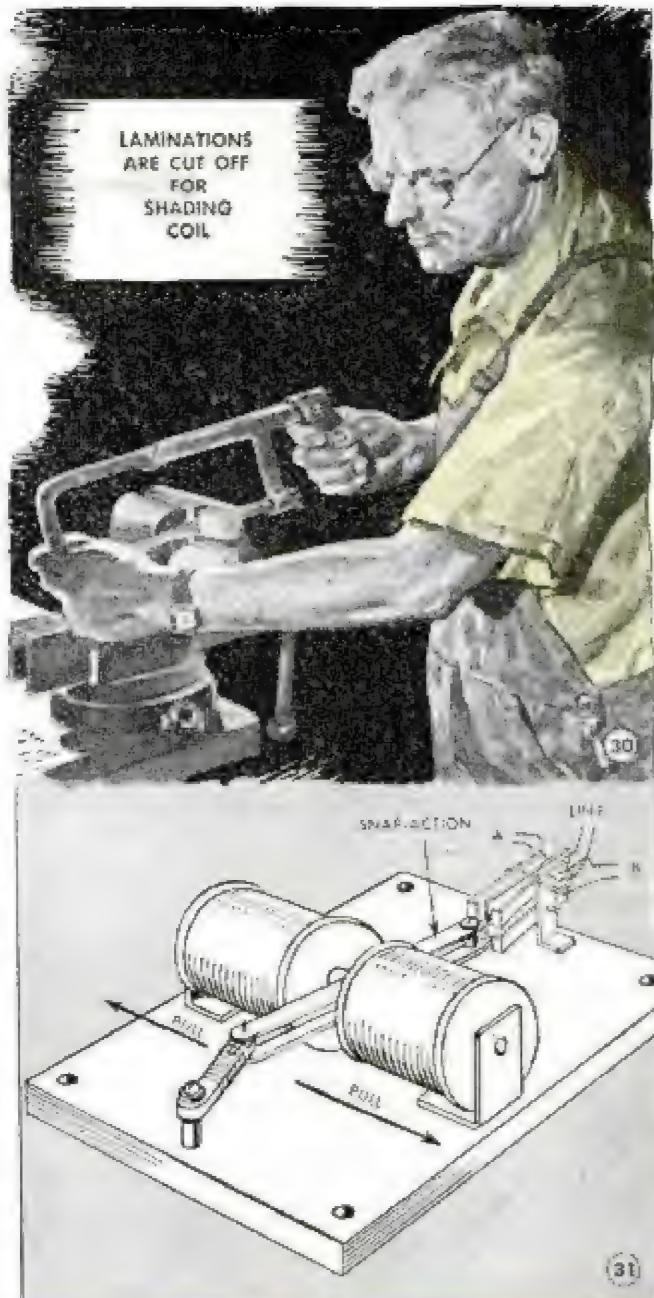
Numerous special types of relays will be found valuable in a number of applications. The "release" type relay shown in Figs. 20 and 24 can be adapted to alarm systems and the like. The advantage of relays of this type is that they do not require any power except when the traps are sprung. When the armature is pulled down, it releases the spring arm which closes the circuit and sounds the alarm. Once started, the alarm will continue to sound until the relay is reset by hand. The "hold" type relay shown in Figs. 23 and 26 is similar in action except that the contact spring is held as long as the relay current flows. The contact spring is released whenever the relay current is interrupted, and remains in that position until reset by hand. This type can be applied advantageously to burglar-alarm systems, as in Fig. 23, and has the advantage that cutting the power supply to the relay will sound the alarm. By use of fusible strips of metal foil in the circuit, the "hold" type relay also can be used for fire alarms. Although these types of relays generally are designed for d.c. current they can be operated on a.c. with dry-disk rectifiers, or if desired can be designed for a.c., using a laminated core as described.

Figs. 28 and 29 show two systems for control of motors which add to shop safety. The system shown in Fig. 28 uses an a.c. relay, operated directly off the line, to control the motor. Pushing the "start" button, which is a normally open push button, operates the relay and starts the motor. The second pair of contacts on the relay energizes the coil and holds the relay in closed

position. The "stop" push buttons, which are normally closed push buttons connected in series with the relay as shown, should be placed in convenient locations near every machine operated by the motor and convenient to every operator. Double-contact push buttons can be used for the stop switches if only the top contacts are used. Pushing any one of the stop switches disengages the relay and stops the motor. The motor then can be restarted only from the main control station where the start switch is installed. If the stop button is blocked down, it is impossible for any worker in the shop to restart the machine until the block is removed. This is very important when a repair is being made to a saw, press or other machine which might cause a serious accident if it were started while repair work was being done on it. The system shown in Fig. 29 accomplishes the same result; however, the relay and stop buttons are operated on low voltage and therefore the control wiring can be installed with ordinary bell wire, without using conduits or fittings required with 110-volt installations.

Another very useful type of relay is that shown in Figs. 31 and 32. This consists of a pair of solenoids, with the plunger operating a toggle switch. The coils are best wound on a fiber or bakelite thin-walled tube, with washers of the same material at the ends. The coil dimensions are calculated just as for an ordinary d.c. relay. The contacts can be arranged in any desired way, using single or double-throw and single or multiple-pole arrangement. It is important to adjust the length of the fixed and moving cores as designated in the plan-view, Fig. 32. The solenoid-type relay can be used to stop and start a motor with push buttons, and has the advantage that current need not flow through the relay except during stop and start operations. Those uses of relays which have been described thus far doubtless will suggest other applications in which relays of different types can be made to serve a practical purpose in controlling circuits or appliances about the home, office or manufacturing plant. By using these fundamental suggestions it is possible to build much more elaborate control systems than those described.

(Continued next month)

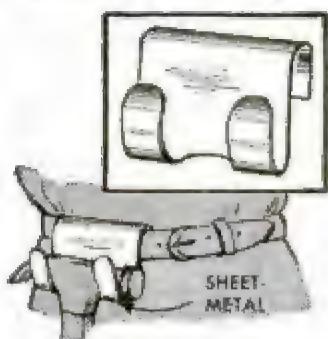


Plywood Pocket on Work Table Stores Drawings Safely



Students of mechanical drawing often have difficulty in storing their finished work so that it will not become creased or otherwise damaged. A good storage place can be provided by making a container or pocket of plywood like the one shown and attaching it to the end of the work table. This will hold the drawings safely and permit the student to refer to them without leaving the table.—Lee H. Nichols, Chicago.

Metal Belt Clip to Carry Hammer



over the belt while the other is bent and cut to receive the hammer head.

Ken Murray, Baltimore, Md.

Lubrication Tips for Automobiles

There are a number of places on a car where lubricant, while not essential for trouble-free performance of the car's power plant and transmission, nevertheless is necessary for smooth operation. Some of these require oil, others grease or a similar lubricant. The stems of door handles, window handles, windshield wiper blades, compartment handles, hood latches, hinges and other linkages require a drop or two of oil about once every six months. The radio

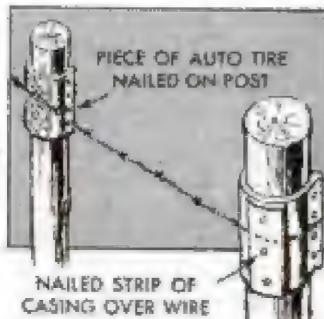
antenna, if of the collapsible type, should be lubricated with oil. First extend it to its greatest length, then put a few drops of motor oil on a clean cloth and wipe the entire surface to deposit a thin film of lubricant on it. Following, collapse the antenna fully to oil the inside surface. Clean grease should be applied to the door-latch strike plates and strikers as well as the radiator and gas tank cap latching surfaces. The interiors of locks are lubricated with powdered dry graphite about once a year. This can be blown in.

Thomas Trail, Baltimore, Md.

Tire Insulators on Electric Fences

Because porcelain insulators for his electric fence were always being broken, one farmer found that old tire casings could be used to better advantage. Pieces were nailed around the post, as shown, and the wire was stretched tightly over the rubber. Then another, but narrower, strip was cut and nailed over the wire to hold it in place. The nails should be spaced so they do not come in contact with the wire and cause a short circuit.

A. H. Waychoff, Phoenix, Ariz.



Posts and Chains Form Stand That Supports Oil Barrel

Temporary stands for barrels and oil drums can be constructed quickly with four metal fence posts and two short lengths of chain for each stand. The posts are driven into the ground to the desired depth and the chains are bolted to the tops to form two slings. The drum rests between the four posts, supported by the chains.—Sgt. Lyman B. Huntington, Avon Park, Fla.

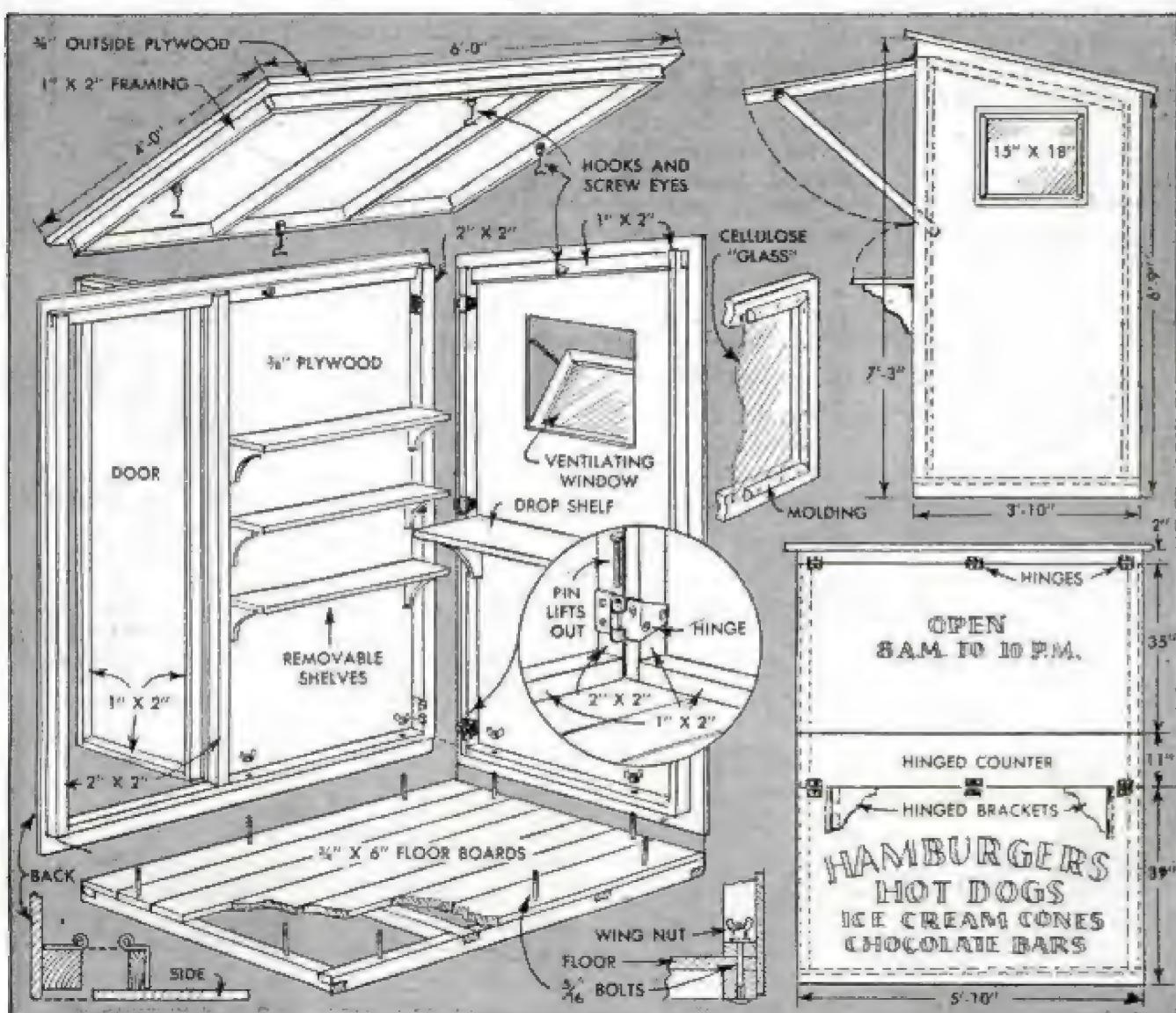


PORTABLE ROAD-SIDE STAND

For the Business Go-Getter



Because of the unusual wing-nut-and-hinge-pin "joinery" it takes one man only a few minutes to set up this roadside stand where the business is best. The whole affair consists of six waterproof plywood panels which make the top, ends, back and divided front. Tongued-and-grooved boards nailed to a 2 by 2" frame make the floor. At closing time the hinged counter swings up and the canopy comes down, closing the stand weather-tight. Exit is through a door at the back.



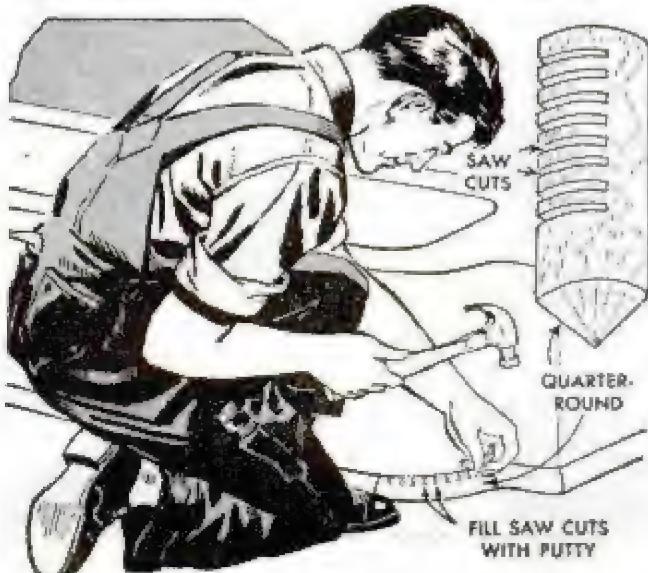
Tray Held on Engine-Block Studs Keeps Tools Handy



Here's a handy tray to hold tools and parts when working on your car engine. The main body of the tray is a board 10 or 12 in. wide, about as long as the engine, with strips nailed around the edges to keep parts from rolling off. Two strips of flat iron several inches longer than the width of the tray are drilled and fastened to it, the strips being spaced so the part extending beyond the tray will slip over studs on the engine block.

Fine Saw Cuts Made in Molding To Bend It Around Curves

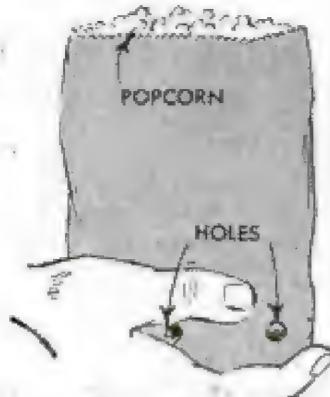
When laying quarter-round molding around the base of a curved object, a few closely spaced saw cuts in the molding will aid in bending it. After the molding has



been nailed securely so that it will not spring, the cuts can be filled with putty. Painting will cover the saw marks completely.—Pfc. Lloyd A. Grover, Pratt, Kans.

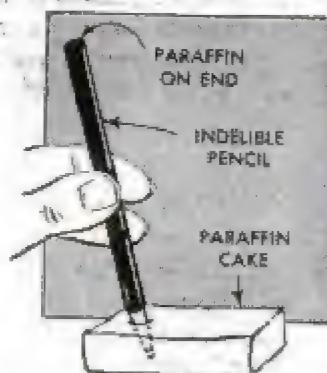
Children Cannot Burst Paper Bag When Holes Are Punched in It

The annoyance caused by children bursting empty popcorn bags in a moving picture theater was prevented by one manager who had the manufacturer of the bags punch several fairly large holes in each one. This prevented the bags from being inflated yet the holes were not large enough to allow the popcorn to escape.—J. M. Callan, Camp Beale, Calif.



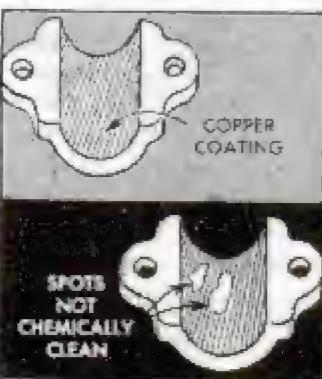
Paraffin Coating Protects Pencil During Damp Weather

During rainy weather indelible pencils that are carried outdoors will soften and not write well. To overcome this difficulty, twirl the point and opposite end of the pencil in a cake of paraffin which has been softened to a degree where it will adhere readily. The paraffin will form a protective coating through which moisture will not penetrate.



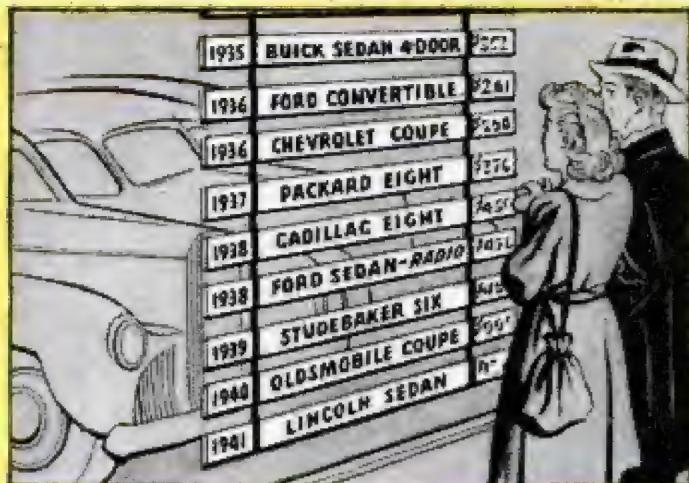
Bearing Surface Can Be Tested With Blue Vitriol

To determine that the surface of a bearing is clean for babbetting, swab the metal with a solution of blue vitriol to which a few drops of sulphuric acid have been added. If the surface is chemically clean an even coating of copper will be deposited, but if there are areas that do not take the coating the presence of impurities is indicated.—John Krill, Youngstown, Ohio.



ATTENTION-GETTING DISPLAYS

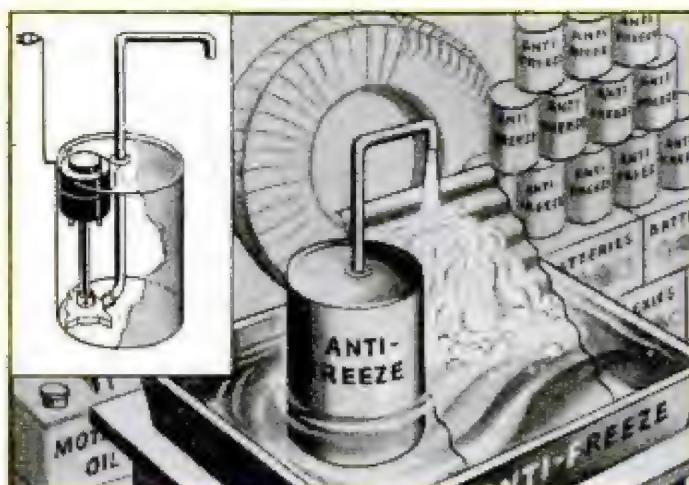
A VENETIAN BLIND in a larger size makes a good interchangeable sign for a show window in a garage. Remove the slats from the blind and sew the straps so they hold the slats in the position shown. Slats should be a free sliding fit in the "pockets" sewed in the straps. Paint the slats black or white in contrast to the color of the lettering you are going to use. The spaces between the slats will still permit automobiles in the showroom to be viewed from outside the window.



TWO EGG BEATERS, with covers which fit snugly into oil cans, are the principal parts needed for setting up this graphic demonstration of the need for seasonal changes of lubricating oil. Fill one can with summer-grade oil and the other with oil of winter grade and place on a suitable bench outside the garage or station so that the display is exposed to seasonal changes in temperature. A sign invites the prospective customer to see for himself how the viscosity of the oil is affected.



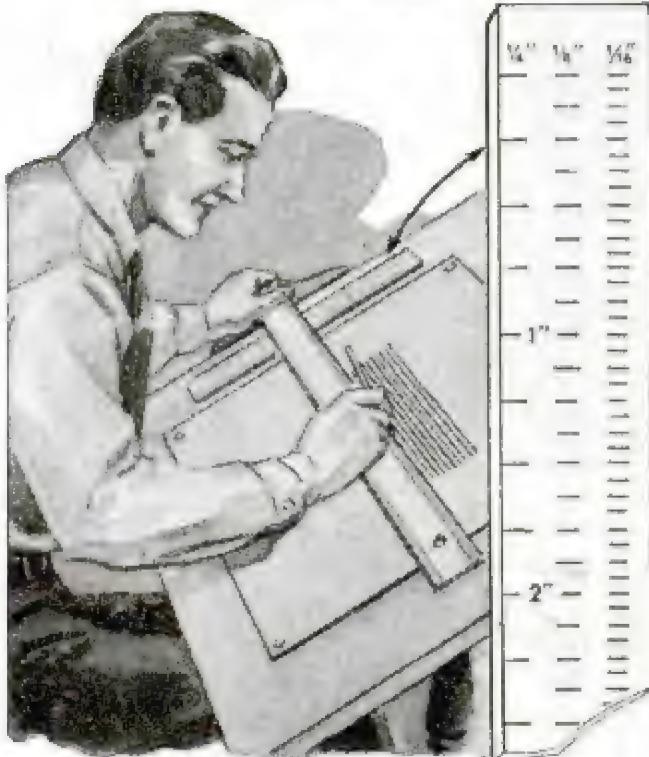
BASIS of this action display of the value of antifreeze is a small motor-driven centrifugal pump housed inside a metal drum. A discharge pipe or tube is attached to the pump and a piece of corrugated-steel roofing is soldered to the side of the drum at an angle, its center being directly under the open end of the pipe. Placed outside in front of the station in a metal tray partly filled with antifreeze the pump circulates the liquid continuously even at very low temperatures.



BY MEANS OF two oil filters suspended side by side from shelf brackets, this simple display effectively conveys at a glance the importance of regularly changing the oil-filter cartridge. The greater weight of the used filter, shown by the spring scales, demonstrates the purpose of the filter in removing dirt and other foreign particles from the crankcase oil. A sign by the filters can carry the wording suggested or any other that may better suit the purpose you have in mind.



Scale Fastened on Drawing Board Aids in Ruling Lines



To make evenly spaced horizontal lines quickly, one draftsman uses a scale having three columns divided into $\frac{1}{4}$ in., $\frac{1}{8}$ in. and $\frac{1}{16}$ in. This is fastened to the left hand side of the board and used as shown in the drawing.—M/Sgt. M. C. Hunter, New York.

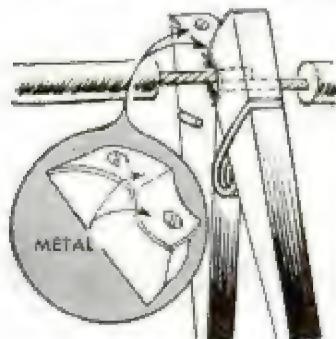
Sheet Folded Over Stack of Paper Prevents Wind Scattering It



the side of the stack. The protected side faces into the wind.

G. E. Hendrickson, Argyle, Wis.

Clip Connects Electric Circuits



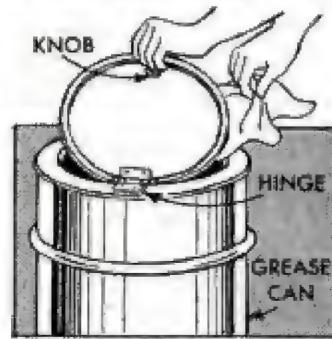
A spring-type clothespin will be found handy at an electrical experimenting bench for temporarily connecting wires carrying low voltage current. The pin jaws are faced with thin sheet copper

which is screwed in place. In use, the bared ends of the wires to be connected are gripped with the pin, the copper facing serving as a current conductor should the wires not be held in good electrical contact by the pin. The clip should not be used on electrical circuits that are carrying more than 24 volts.

Oily Rags Kept in Metal Can To Reduce Fire Hazard

Oily rags used in the commercial workshop should be kept in covered metal containers to reduce the fire hazard should the rags suddenly catch fire. Handy containers for this purpose can be made inexpensively from empty 5 and 10-gal. grease cans. These are cleaned thoroughly and the covers are hinged and provided with lifting knobs. Such containers also are handy for clean rags used in the shop. A can may be painted one color for clean rags and another for oily ones.

D. E. Horn, River Forest, Ill.



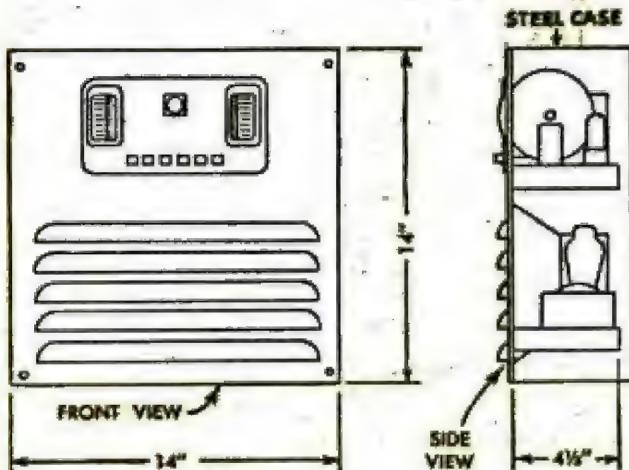
Temporary Support for Sign Card Improvised With Paper Cups

If a temporary sign-card holder is needed, one can be improvised using two paper cups of the rigid type. The cups are slit halfway across the bottom and down one side to serve as holders, one on each side of the sign. The larger the cups, the larger the sign they will be able to support.

Hillard J. Kowalski, Chicago



Radio and Electronics



①

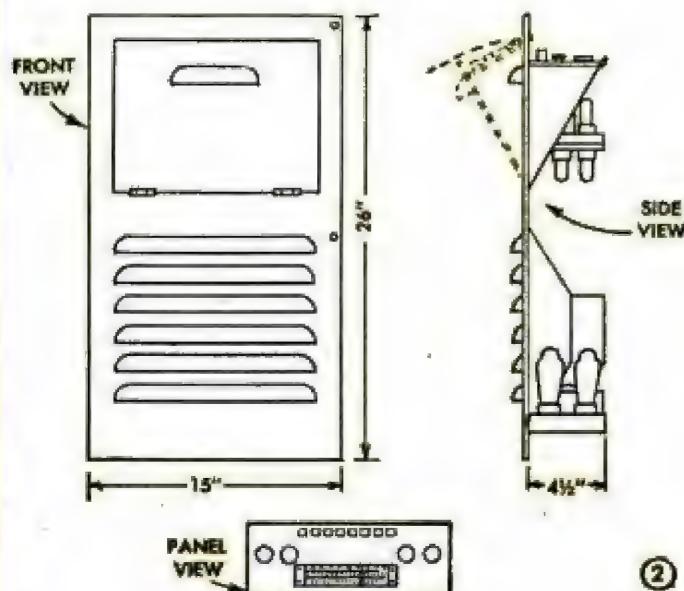
Built-in Radios for Every Home

DESIGNED for built-in installations where room space is at a premium, these ultramodern receivers are assembled on heavy steel panels and require only $4\frac{1}{2}$ inches of wall depth. This permits installation in the walls of both new and old homes. Closet doors also offer a convenient location and simplify installation in older homes. Proper ventilation is provided and all controls are standard.

Sketch A shows a living room with a 7-tube superheterodyne in a handy wall location directly above a writing desk or table. This set, detailed in Fig. 1, is a stand-

ard a.c. broadcast band receiver with 6 station push buttons. It employs a 6-in. speaker and has an audio output of 5 watts. Connections are provided for a record player if desired.

A 17-tube Ansley "Paneltone" installation is illustrated in sketch B and the dimensions are given in Fig. 2. It will be noted that this unit has a top section that tilts out to bring the control panel to a convenient position. The receiver includes FM, broadcast and short-waves, push button tuning and phono connections. It uses a 12-in. speaker and has an output of 15 watts.



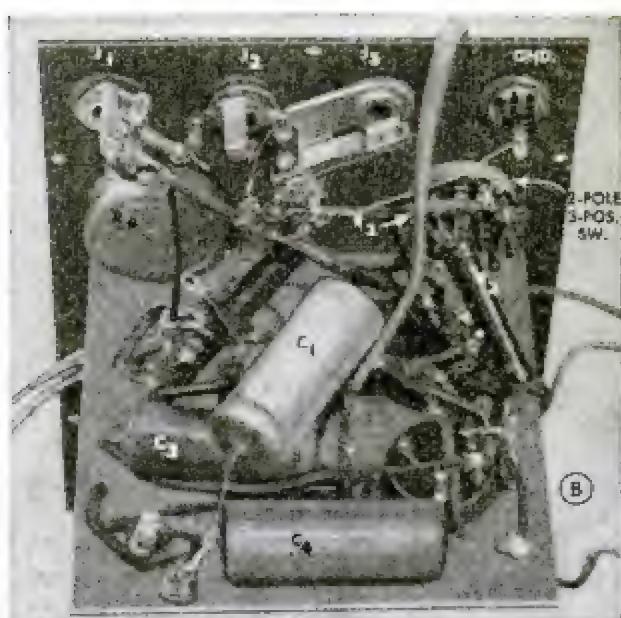
②

ELECTRONIC VOLT-OHM READER

By Arthur I. Rattray

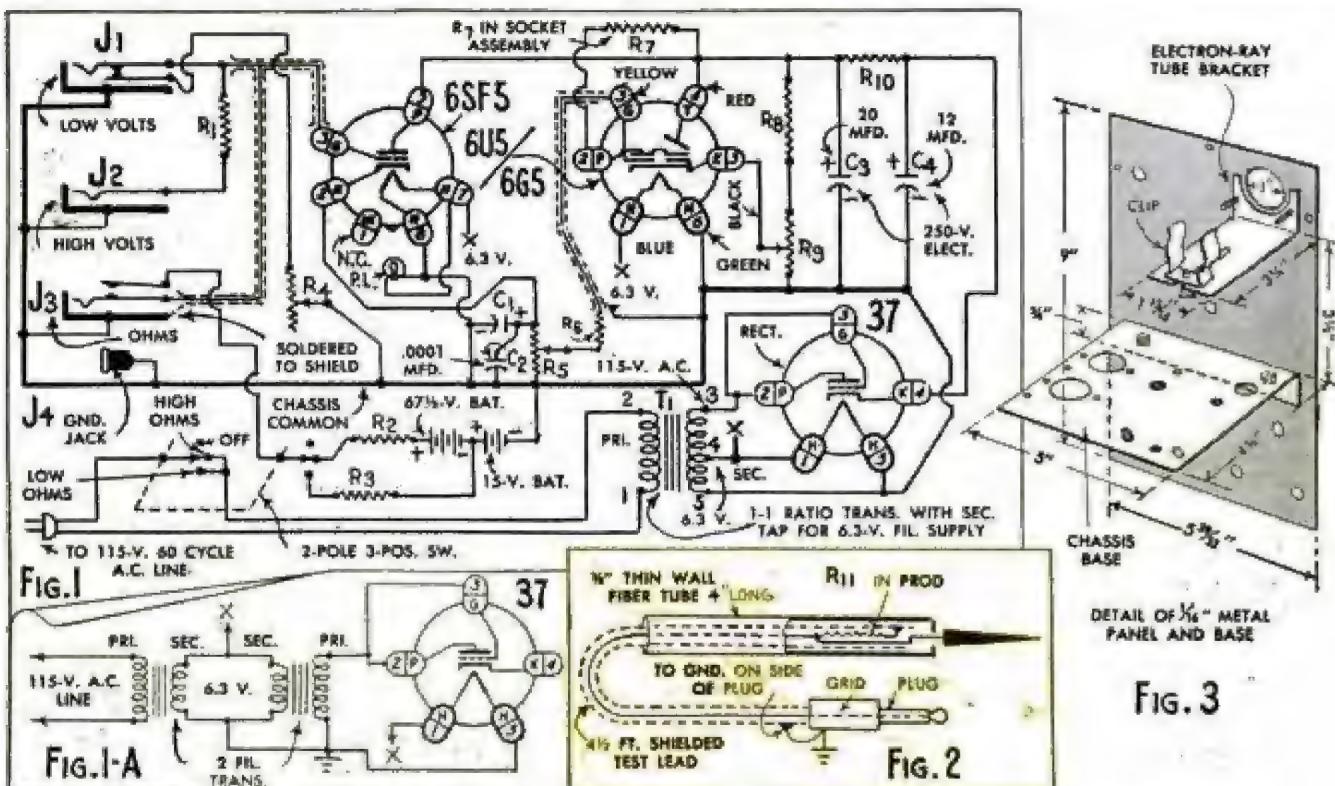
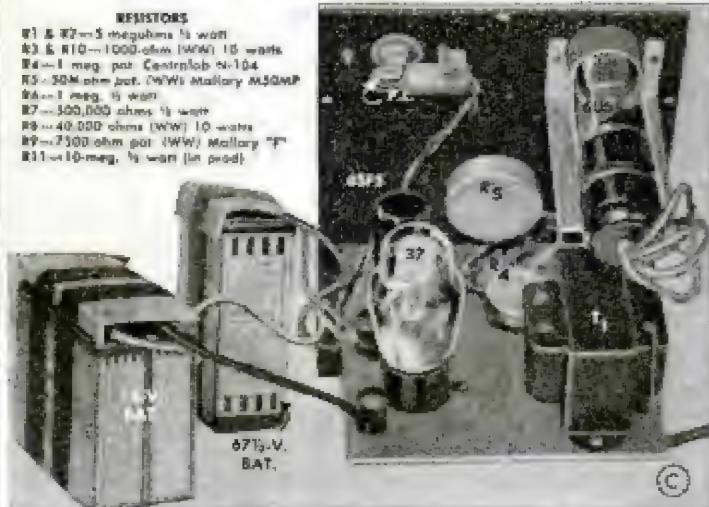
THIS electronic voltage and resistance reader is built with inexpensive parts and features a "magic eye" electron-ray tube. As there is no delicate meter to burn out it provides a rugged and efficient test instrument for advanced students and experimenters. A.c. and d.c. voltages may be read up to 1000 volts; one resistance range reads to 1000 ohms and the other extends to 3 megohms.

If the 1-1 ratio, tapped, line isolating transformer T1 is not easily available, use the two filament transformers with paralleled secondaries as shown in Fig. 1-A. The MEA6 "Amphenol" electron-ray tube socket assembly has a tiny 1-megohm resistor in the socket; remove this and substitute R7. Details for the shielded positive test prod appear in Fig. 2; tiny resistor R11 is connected inside the lower end. The "ground" prod is standard.



RESISTORS

- R1 & R7—3 megohms 1/2 watt
- R2 & R10—1000-ohm (WW) 1/2 watt
- R4—1 meg. pot. Centriflex N-104
- R5—50M ohm pot. DFWI Mallory M50MP
- R6—1 meg. 1/2 watt
- R7—300,000 ohms 1/2 watt
- R8—40,000 ohms (WW) 1/2 watt
- R9—7500-ohm pot. (WW) Mallory "F"
- R11—10-meg. 1/2 watt (WW)

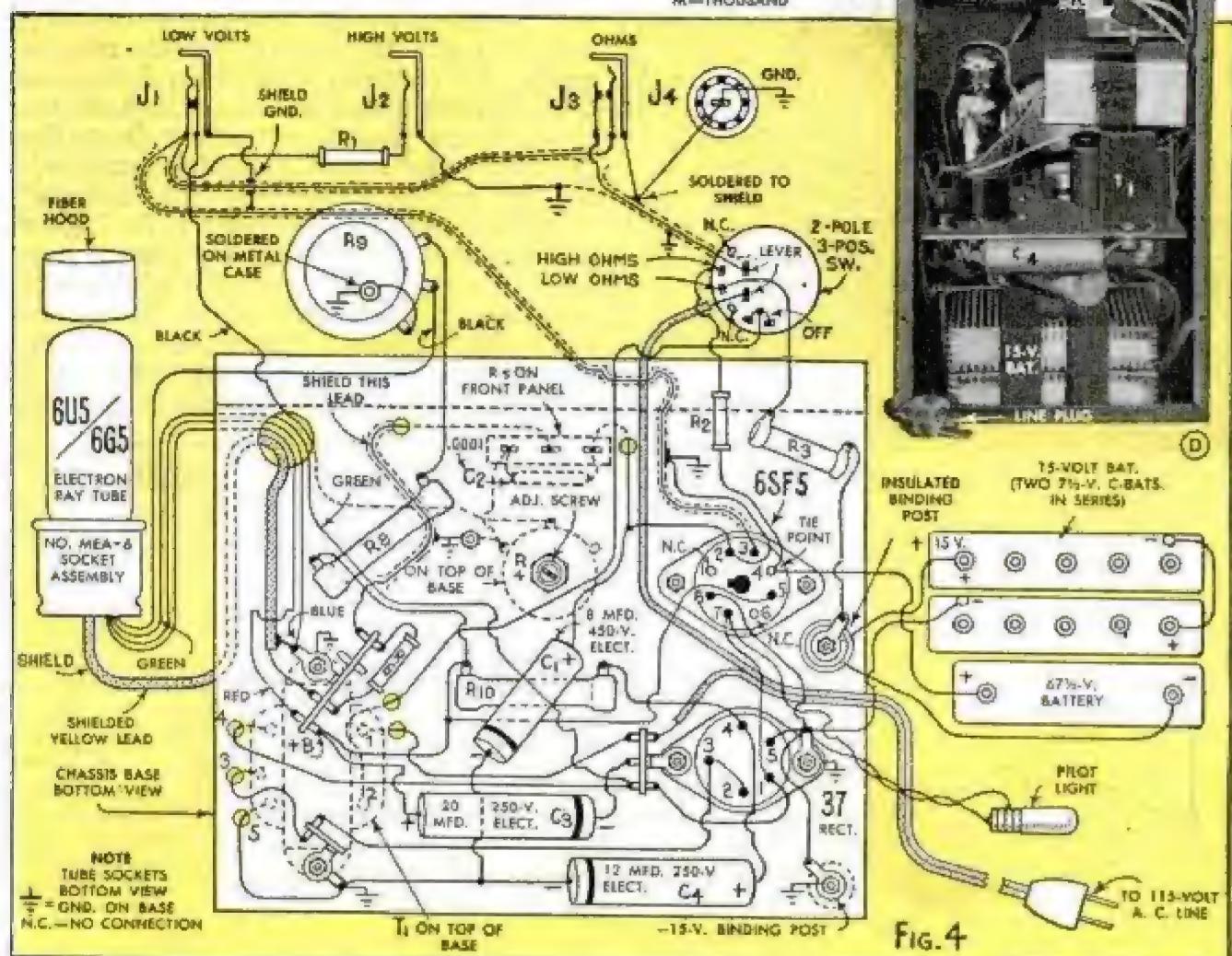
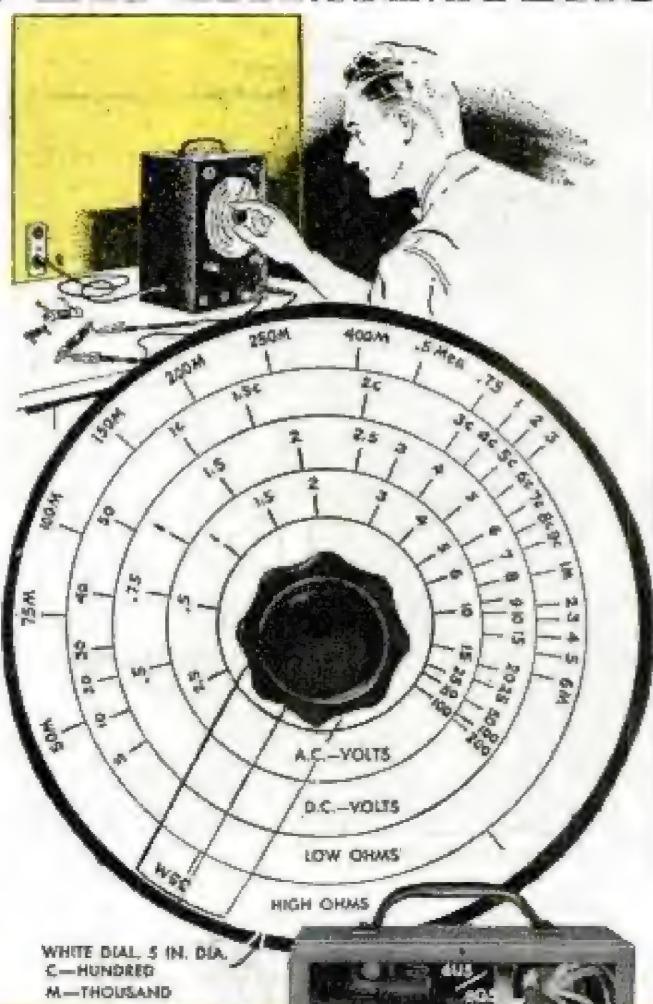


for STUDENTS and EXPERIMENTERS

Photos B and C and Fig. 4 show top and bottom views of the base; the case is 9 by 6 by 5 in. deep. The calibrated direct reading cardboard dial (R5) has a pointer of clear plastic with engraved center line filled in with India ink. To calibrate this dial, after all wiring is completed, borrow a vacuum-tube voltmeter to use for checking — an RCA Junior "Voltohmyst" or similar. The first calibrating step is to turn R5 all the way to the left; plug positive test lead into J1 and negative into J4. Short the prod ends and adjust R9 until the eye closes to a hair line. Next, place a low d.c. voltage across the test prods at correct polarity. The eye now will open; adjust R5 to close the eye and mark that point of known voltage on the dial.

To provide a checking voltage source, a 50,000-ohm potentiometer was connected across the "B" supply of a receiver, as an adjustable voltage divider. Connect (Gnd.) prods of both the borrowed voltmeter and your unit to the negative "B" side. Progressive voltage steps then are read by first touching the positive prod of the borrowed meter to the potentiometer arm, then substituting your positive prod for calibrating.

(Continued to page 236)



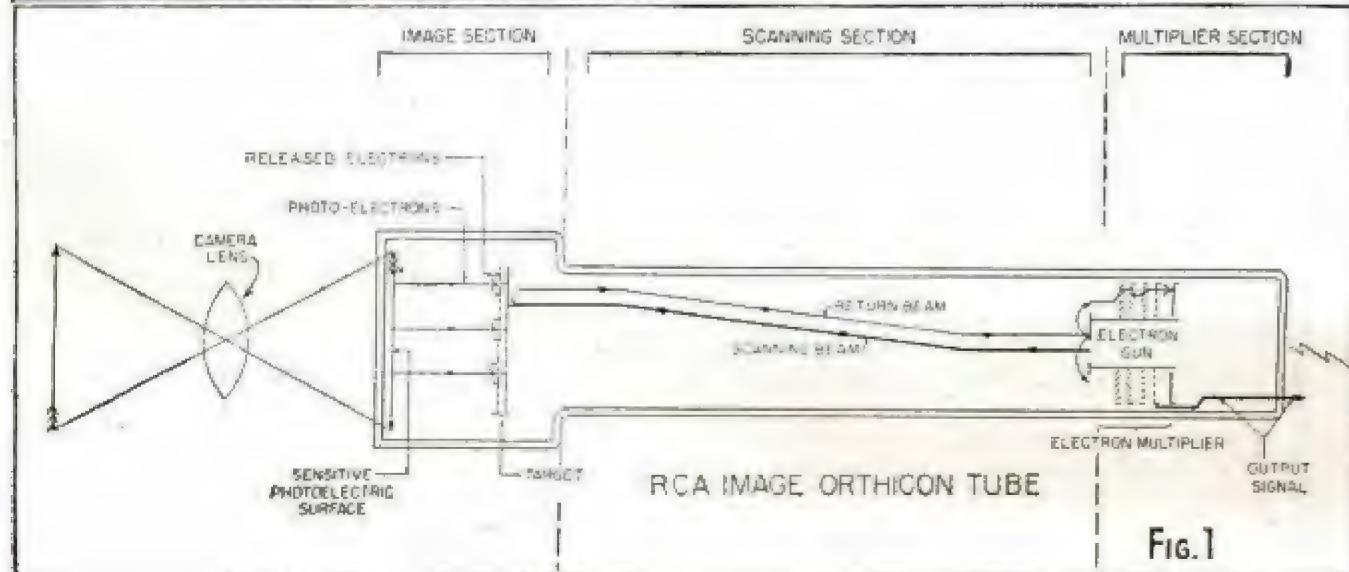
Ultra-Sensitive Television "Camera" Pickup Tube

By F. L. Brittin



KEEN "eyesight" is necessary if television pickup tubes are to match the sensitivity of the human eye under varying lighting conditions. RCA engineers have solved this problem with the image orthicon tube that automatically adjusts pickup sensitivity to include extremely low light levels. In other words, what the television camera "sees" at the remote pickup point no longer need be brilliantly illuminated in order to provide a good clear video picture in the home television receiver, as illustrated in photos A and B. The light from the flame of a match was sufficient. A further convincing candle-light demonstration was given at the recent I.R.E. winter technical meeting held in New York City.

The iconoscope "camera" tube, described in the October 1944 issue of this magazine, operated as a video transmitter under strong illumination; the orthicon tube was a second step in sensitivity and now the compact image orthicon, photo C, takes over. The iconoscope, or usual television pickup tube, has an electron gun, a photo-sensitive mosaic or "target" and a means for vertically and horizontally controlling the sweeping beam. The image orthicon retains these features and adds several more. An electron multiplier, built into the tube, multiplies the modulated stream of electrons that is returning from the "target," as indicated in Fig. 1, before feeding the output signal into the "camera" amplifiers. A two-sided "target" for higher photo-sensitivity permits the charge pattern to be formed on one side while scanning takes place on the other. These improvements greatly increase overall sensitivity and provide stable operation over a wide range of shifting light conditions.





Cars shouldn't smoke, either!

SMOKE from a car means burning oil, wasted power, cumulative damage to cylinder walls. All these can be cured by reconditioning the engine and installing new Sealed Power Piston Rings. They lengthen engine life, restore original power, save oil, save gas.

Whatever the make, model, or degree of cylinder wear in your engine, there's a Sealed Power Ring Set specifically engineered to do the best possible job. Sealed Power people are proud of their product and its 34-year record of preference by leading car, truck and engine builders. Ask your favorite repairman to install a Sealed Power Individually Engineered Ring Set in your car now! Sealed Power Corporation, Muskegon, Michigan and Stratford, Ontario.

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These ring sets are engineered to save gas without sacrifice of oil economy, to save oil without inducing friction and cylinder wear. Each set gives balanced performance in a particular engine.

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Cylinder Sleeves
Valves
Water Pumps
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Get Bass!

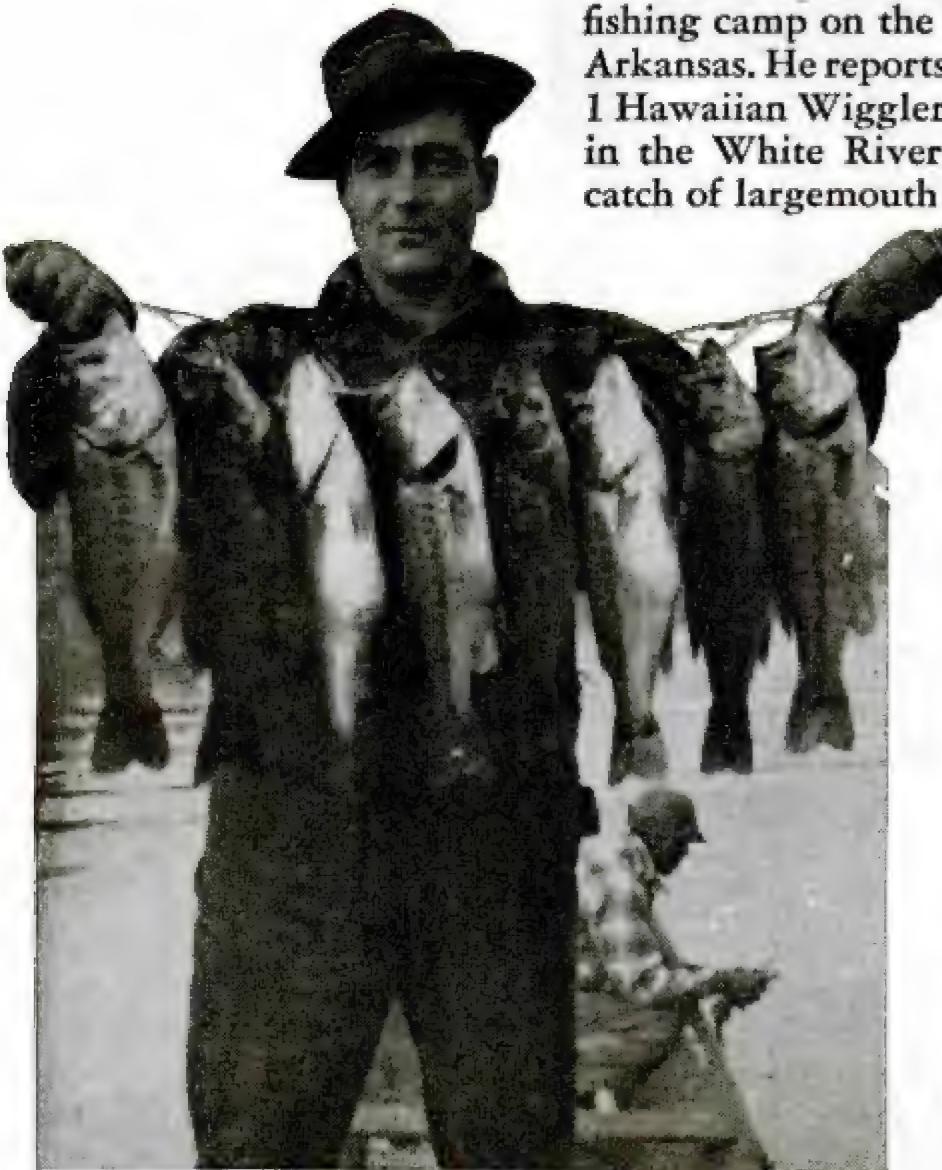


Shallow Running
No. 2 Hawaiian Wiggler — \$1.10

Favorites at Fishing Camps For Large and Smallmouth Bass

At left is photo of Elmo Hurst, who runs a fishing camp on the White River near Cotter, Arkansas. He reports that the deep running No. 1 Hawaiian Wiggler is a killer for smallmouth in the White River and its tributaries. This catch of largemouth was taken on the shallow

running No. 2 Hawaiian Wiggler at nearby Norfolk Lake. He reports that weedless Hawaiians with their quivering hula skirts are favorites with the anglers at fishing camps along the White River.



Elmo Hurst with bass caught on No. 2 Hawaiian Wiggler

Send for Free Catalog

If you want some fascinating and informative reading, send for my free catalog that is loaded with photographs and letters from fishermen telling where and how record catches have been made with Hawaiians. It also gives the latest information on Jitterbug, my surface bait that is ideal for calm waters day or night.

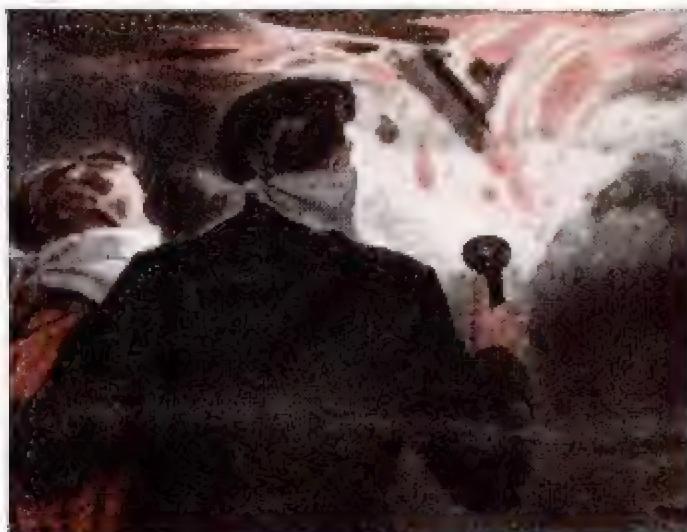
FRED ARBOGAST & CO.
1604 North St., Akron 3, Ohio

How to Fight the Menace of FIRE

...A Wet Towel and a Flashlight may save your life!
—says the National Safety Council



1 Fire is always dangerous—especially dangerous at night, when you may be asleep. And most fires do occur at night! If you smell smoke, reach for your "Eveready" flashlight first. *Feel doors before opening them*, for a single breath of fiery air can kill you! If a door is hot, don't open it!



3 To avoid danger, you have to see it—so keep your flashlight with you until you're safe! Watch for collapsing ceilings... But the best way to avoid fire is to prevent it! Your flashlight—with fresh "Eveready" Batteries—gives a much better light than matches or a candle, and it's much safer too!

2 Wet a towel or cloth; cover your face and arms. Close doors to reduce drafts that may fan the flames. If heat is severe, remember that heat rises—crawl! If trapped on upper floor, make a rope of bedclothes. As a last resort only, throw out a mattress and jump down onto it.

For
**EXTRA POWER,
EXTRA LIFE
—AT NO
EXTRA COST**



4 To help fight fire—or for any flashlight need—rely on "Eveready" Batteries. Ask your dealer for them by name. The days when you had to accept "second choice" batteries—or none—are past. "Eveready" Batteries have no equal—that's why they're the biggest-selling flashlight batteries in the world!

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EVEREADY
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The registered trademark "Eveready" distinguishes products of National Carbon Company, Inc.



A Nicholson 12-inch Flat Second Cut File is being used here in filing a punch die.

TOOLMAKERS' files must be right for the job

Dies, jigs, fixtures, gauges, cams, trips, holders, spindles—the closer the tolerances to be worked out by hand, the more careful should be the selection of files. . . . Second Cut files instead of Coarse or Bastard; Smooth instead of Second Cut; Swiss Pattern or Special Purpose instead of Regular types.

Nicholson is virtually a "file engineering laboratory"—an establishment where the requirements of files for different purposes and metals are a never-ending study. Every day presents new opportunities for tool, die, and other work-bench specialists who *know their files*.

THE MILL SUPPLY and HARDWARE houses selling Nicholson or Black Diamond files are good places to learn about and obtain *the right files for EVERY job*. And Nicholson's "FILE PHILOSOPHY" is a 48-page book worth writing for.

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NICHOLSON
FILES FOR EVERY PURPOSE

NICHOLSON
U.S.A.
MADE IN U.S.A.

Electronic Volt-Ohm Reader

[\(Continued from page 231\)](#)

Always starting with the eye closed, your prod will open the eye, then you adjust R5 to close it and mark that known voltage. For high voltage scales, adjust known voltage to 100 volts; then plug your positive prod into the high volts jack. Now set R5 pointer to 10 volts on the low volts scale; adjust R4 until eye closes. This automatically calibrates the high volts scale. After this adjustment, to read high volts merely multiply the low volts scale by ten for voltage value across prods. A.c. voltages are calibrated in the same way except a line cord with plug is attached to the 50,000-ohm potentiometer instead of the radio's "B" supply; start from closed eye position and carry out the same procedure.

To calibrate ohms, check resistors of various values with borrowed meter; insert positive plug in your "ohms" jack and note that the eye is opened by the battery. Adjust to zero, as in first step; separating prods will open eye again. Clip known resistance across prods, set range switch and adjust R5 to close eye at calibrating point on dial. Repeat for both ohms scales. Detailed student material list is R-343.

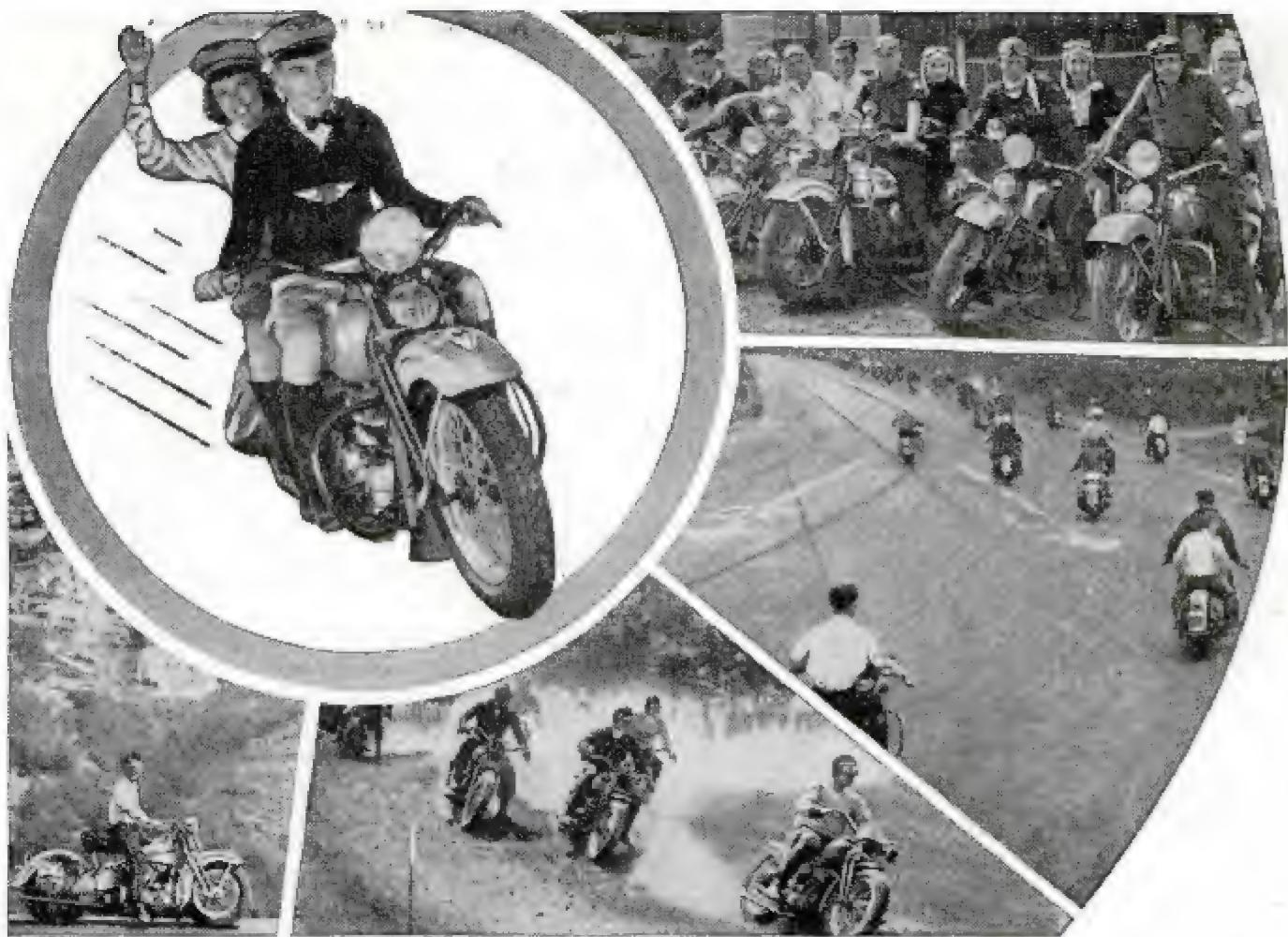
Hit the Trail by Trailer

[\(Continued from page 149\)](#)

pliances, with adequate storage lockers for carrying clothing.

Trailers are being put to various uses. A camera company is using a fleet of trailers as traveling service stations; circulating libraries use trailers for carrying books; ministers reach remote regions in trailer-chapels, and several police departments have trailers converted into traveling crime laboratories outfitted with fingerprinting, ballistics and cast-making equipment. One school system has a domestic science trailer with a modern kitchen which is towed from school to school.

You don't need to wait until exactly the right trailer that fits your ideas and needs comes along. Like your automobile, you can always turn in your present trailer on a newer model. You can tow a trailer to practically any spot that you can reach by automobile, even to the top of Pike's Peak. You can stop nearly anywhere off the highway for overnight parking, and there are some 4000 trailer parks in the United States that you can use for longer stays. "Three rooms and a bath" that you can tow comfortably and safely at 60 miles per hour are here today.



FOR THRILL-PACKED EVENINGS • WEEKENDS • VACATIONS *Ride A HARLEY-DAVIDSON*

PACK every spare hour brim full of pleasure—swing into the saddle of a Harley-Davidson and go where there's fun! Join other Harley-Davidson fans in the world's greatest sport—motorcycling. Ride along shimmering lakes and rivers—see majestic hills and forests—visit the country's many natural wonders and beauty spots. Go when-

ever you get the urge—stop wherever you choose—with no timetables to follow. What's more, there's always plenty of excitement and thrills when you ride a world famous Harley-Davidson on tours and endurance runs—or take in race meets, hillclimbs and other motorcycling events. See your Harley-Davidson dealer AT ONCE!

HARLEY-DAVIDSON *Motorcycles*

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Please send at once free copy of 24-page "Enthusiast" Magazine, filled with motorcycle action pictures and thrilling stories.

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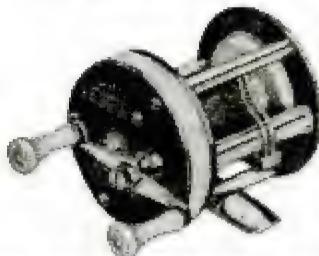
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Coming YOUR Way!

Here are the South Bend reels that are *now* in production; some may be on their way to your dealer. We suggest you keep in touch with him for early delivery of the reel of your choice.

THE PERFECTORENO—For Bait Casters



Now, Fishin's Fun — For Every One! Any one can cast, without backlashing, with a Perfectoreno. Needs no thumbing — makes casting easy, effortless, a real pleasure. Two models are now in production:

No. 775, Nickel Silver Frame; Mottled Pearl Grips.
No. 760, Maroon Anodized Aluminum and Smoky Pearl.

THE OREN-O-MATIC—For Fly Rod Anglers



Most popular automatic fly rod reel ever made. Hangs vertically from the rod, in natural, balanced position. Extra long, extra strong spring; anodized aluminum frame. Two of the most popular models of Oren-O-Matic reels are being made first:

No. 1130, Rich Maroon, Capacity 50 yards. "G" Line.
No. 1140, Rich Maroon, Capacity 80 yards. "G" Line.

ANTI-BACK-LASH REELS—The Original and Genuine



These are the original Anti-Back-Lash Level-Winding bait casting reels, the reels that first did away with discouraging snarls and tangles of line. So well are they made that some have been used more than 30 years, many handed

down from father to son. Two popular models are now in production—No. 1000 and No. 450. No. 1000 is illustrated.

SOUTH BEND BAIT COMPANY
891 S. High St., South Bend 23, Ind.

SOUTH BEND

A Name Famous in Fishing

Mopping Up Starfish

(Continued from page 161)

It is simply made of two lengths of pipe, two small wheels and a rubber hose. The spreader pipe is perforated at intervals to distribute the lime. At each end of the spreader pipe is a small wheel which allows the device to roll along the ocean bottom. At right angles to and in the center of the spreader pipe is the feeder pipe through which a two-inch rubber hose feeds the quicklime. From 500 to 700 pounds of quicklime are used per acre of bottom and the corrosive action of the lime kills most of the starfish there.

Starfish travel about while oysters do not. In an effort to discover just how far they range each year, Dr. Loosanoff stained starfish with a blue dye and released them. Although moving only a few inches per minute, some of the colored starfish were found nearly a mile distant from the starting point 10 months later.

Radar Cues the Navy Fighters

(Continued from page 168)

were charged with the weighty responsibility of aiding in the recovery of the planes overhead—the positions of the downed aircraft were being carefully noted—bearing, range, latitude and longitude of the emergency radar signals and the pilots' reports. Transmitted to the bridge and the flagship, this information was used as the basis for the search that followed in the next two days. That more than 80 percent of the downed pilots were recovered was in no small part due to radar in its role as life-saver. The number of pilots who were aided back to the lighted carriers through the Pacific night never was tallied. But there were many.

The story of radar's scientific development and tactical employment in time will be a thrice-told tale. It is doubtful, however, if many except those who were in it will remember much of the role played by the thousands of reserve officers who manned the CICs of the Fleet or lived on K rations and hope in island tents, and who, so to speak, wielded radar as a weapon.

The word "wield" is used advisedly, for oddly enough, despite its delicate, scientific complication the radars of the Navy have been operated not by technicians but by the butcher - baker - candlestickmaker majority who have made up the enlisted and officer personnel of the shore and sea radar establishments.

There are, of course, the technicians—

(Continued to page 240)

NEW ALL-METAL, FAST, FREE-FLYING GAS MODEL

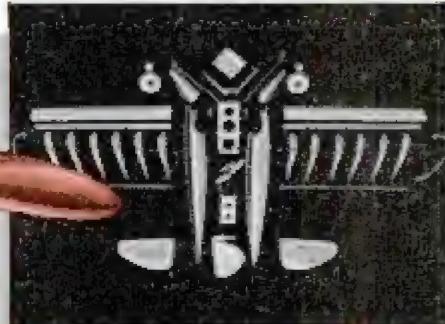
BUILD AND FLY THE MODERN

Metaline

SKY-VAHL



Designed by Harold R. Johnson



Here's fun with a profitable future

LEARN THE FINE POINTS OF FLYING — Model building is a sure way to prepare yourself in aviation. The all-metal SKY-VAHL flies and maneuvers like the big commercial and military planes. Take-off and landing characteristics are the same and your practice and control adjustment for normal flight make model flying one of the most important phases of learning the science of flight.

A METAL-WORKING EDUCATION — Right in your own home workshop you can learn the fine art of the metal worker. Commercial and military aircraft are all-metal . . . so is the SKY-VAHL! Assembly time runs from 8 to 12 hours. All parts, including all rivets and screws, are supplied. You need only a few standard tools used in every home. Full instructions and drawings guide you. Everything durable is made of metal . . . the SKY-VAHL is the first all-metal model plane. Be the first to build it in your neighborhood!

A FASCINATING HOBBY IN AN AIR AGE — Everyone has a hobby. Your hobby can be the most interesting imaginable. Hours of fun, in your workshop and in the field, are yours when you build and fly the Metaline SKY-VAHL!

RUGGED—ALMOST INDESTRUCTIBLE — No wood-and-glue job is this! The Metaline SKY-VAHL will take many a hard landing. You just make repairs right on the field and she'll keep right on flying!

DEALERS & JOBBERS

The SKY-VAHL is one of the New METALINE Products and is now in large production. It's a fast seller at a good profit. Order now for early delivery.

SKY-VAHL
Manufactured by
VAHL ENGINEERING COMPANY

All the parts above are stamped out ready for finishing and assembly. Purchase price includes everything but engine and propeller. Wingspan is 59"; length 35". The Metaline SKY-VAHL, pilot-designed, will give you many days of fun and good sound experience in metal-working and flying.

ORDER FROM YOUR DEALER OR SEND THIS COUPON NOW!



VAHL ENGINEERING COMPANY

505 Court St., Brooklyn 31, N. Y.

Please RUSH, postpaid, 1 Metaline SKY-VAHL Kit. I remit payment as follows:

- Enclose check (or money order) for \$23.75
 Enclose \$3.75. I will pay balance of \$20 on delivery plus few cents C.O.D. charge.

Name.....

Address.....

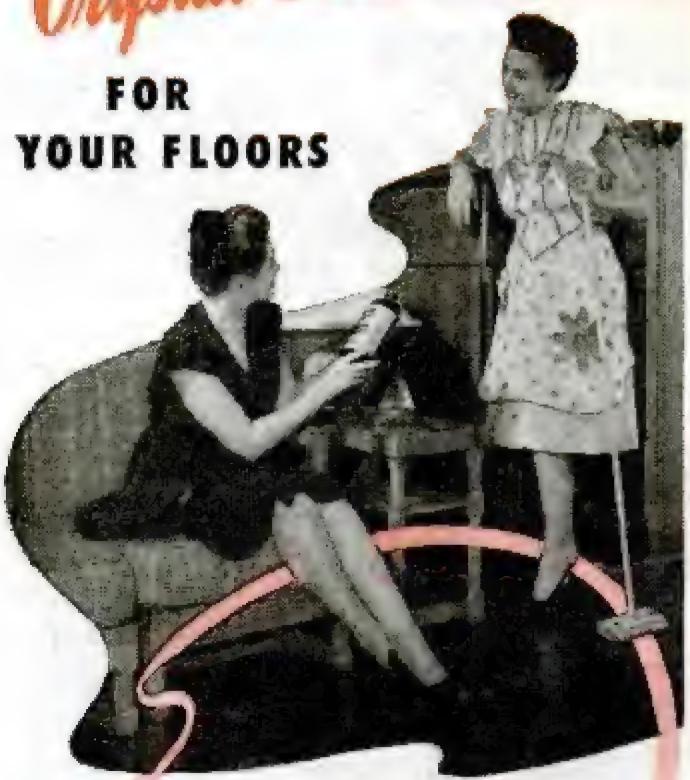
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Your floors take on luxuriant richness with Self-Polishing SIMONIZ. Crystal-clear so natural floor beauty "shows through." Longer lasting, too . . . dirt and spilled things wipe up with a damp cloth . . . restoring original brightness. Spreads evenly with cloth or applicator . . . actually shines itself to an exciting brilliance . . . without rubbing or buffing. For lovelier floors with less care . . . get Self-Polishing SIMONIZ today!

Shines as It Dries . . .

Self-Polishing SIMONIZ is ideal for use on linoleum, asphalt or rubber tile, or finished wood floors. Sold by grocery, hardware, drug, paint, 5 cents to \$1, auto accessory or department stores.

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Recognized for over thirty years as authorities on preservation of fine finishes.



Self-Polishing
SIMONIZ
FOR FLOORS



graduates of the country's engineering schools—MIT, California Tech, Carnegie Tech, Virginia Polytech and a dozen others. Without them and their untiring vigilance in keeping the gear going, the CIC officers of the Fleet could not have carried on. The fighter director and CIC officers, however, were carefully and deliberately chosen . . . for their seemingly complete lack of scientific training.

Typical in its CIC personnel was the complement of the USS Wasp, of which one of the authors was FDO. Of the eight officers in the CIC complement, one, the original FDO, was an able young fighter pilot, one was a former college professor of English, one an erstwhile graduate student in forestry, one a high school principal, one a meat salesman, still another a sometime lawyer, another an insurance salesman and one a recent college A.B. And of the top-notch task force and group fighter directors none was more esteemed than Lieutenant Commander "Jimmy" Winston, New York broker, former Master of the Hounds of a Long Island Country Club, holder of the Legion of Merit, who went to his death in the flames that swept the USS Franklin.

By what military osmosis did these men become radar officers? Actually—and this is one of the abiding and little sung miracles of this war—the fact that people with such disparate backgrounds should meet in the CICs of combat vessels is not much more surprising than the fact that the flight deck officer of the Wasp should have been—as he was—a former New Orleans lawyer and the hangar deck officer a millionaire New York broker.

The process which turned them into radar tacticians is a story in itself—of initial make-do when both radar equipment and instructors were gourd green—of gradual experimentation and intelligent application of sorely won battle lessons and, above all, of the determination and effort of thousands of unsung and unheralded reserve officers who, like all Americans in battle, turned their hands to the nearest or the assigned task—and got it done. The skill, bravery and fortitude of our Navy pilots never can receive too much praise, and certainly in the annals of sea warfare the names of our captains and admirals of this war already hold exalted places. It is no disrespect to them nor does it detract from their manifold achievements to say that, without radar, much that they were able to accomplish would have been impossible.

It is difficult to imagine how the sea assault on the Jap's far-flung empire might have been conducted had there been no

(Continued to page 242)



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radar. History is full of "ifs", of course. And Navy historians, analysts and strategists will be deploying today's long vanished fleets in the eternal game of might-have-been long after radar has taken its place as the crude progenitor of scientific apparatus yet unborn. It is a truism, too, to say that without the skills and teamwork of the millions of gunners, mess cooks, plane pushers, engineers and a thousand other occupational activities of hundreds of thousands of officers and men we would, at best, be sitting hemmed in and impotent in the continental U. S. A.; yet it is hard to see how we could have moved forward at all without radar. Certainly it may be said without exaggeration that the development of CIC as a function of command is up with the leaders in "most important new developments" of the extraordinary naval warfare of World War II.

There's Gems in Them Thar Hills!

(Continued from page 157)

From one of these field excursions a 75-year-old woman came brightly lugging a huge chunk of agate weighing at least 40 pounds. "I'm going to have a pair of bookends out of this if it kills me," she gleefully told fellow prospectors. Another enthusiastic gem hunter, before the war, traveled 12,000 miles on a lone prospecting trip through 38 states.

No road's too long if there's promise of gems at the other end. Wendell O. Stewart and Earl Calvert of Los Angeles once went into Mexico on a trail of rare selenite crystals, reported in an old silver mine. The auto road ended at Chihuahua, but on into the desert they plunged—bumping 80 miles over a narrow oxcart trail, fording rocky river beds, gambling on the depth of the water. Seven hundred feet underground, they found caverns lined with shining, ice-clear selenite crystals, some of them six feet long, some actually showing a water bubble inside where the six-sided crystal had not yet grown to maturity.

One western amateur converted an ancient Dodge truck into a desert car with a 20-gallon water and a 60-gallon gasoline tank and huge tires to take him over soft sand. A single trip yielded him 800 pounds of petrified palm, a beautiful mineralized wood, and a quantity of rock speckled with small circular rings—hollow reeds once growing in prehistoric lake bottom mud.

If the amateur is searching for magnetite, the "lodestone" of the ancients, he carries an indicator, a large sewing needle dangling on a string. Sold in bulk, the rock

(Continued to page 244)



WOULDST CARVE WOOD?

You'll Find X-acto Knives "Indispensable" Says Famous Wood Sculptor

Visitors to the Open Air Art Show in New York's Washington Square last Fall were fascinated by the sight of a sculptor carving sophisticated modern figures with a small metal knife.

The sculptor was Nicholas Mocharniuk, whose work has won acclaim in galleries and art centers throughout the country. And the knife he was using was a No. 6 X-acto!

Mr. Mocharniuk uses X-acto Knives because he says, "they give the best results with the hard wood I use . . . they are especially suited to cutting away areas usually hard to get at."

You Can Take It With You

Another advantage Sculptor Mocharniuk points out about X-acto, is that he can take it with him and get in a bit of extra work while sitting on subways,

trains or park benches.

Whether you work in hard or soft wood, in your workshop or out in the park, you too will find this removable-blade hobbycraft knife the handiest little tool you ever had.



CHOICE OF EXPERTS IN EVERY FIELD

With its 13 scientifically designed blade shapes, and 3 all-metal handle styles, X-acto is the perfect tool for the most difficult or delicate cutting job. Blades are of fine surgical steel, scalpel-sharp. Model builders, artists, whittlers, photographers, swear by easy-to-use X-acto.



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KNIVES & TOOLS

X-acto Knives & Knife Chests From 50c to \$5.00

* Buy where you see this sign. At better hardware, hobby and gift shops — or if not available write direct to X-acto Crescent Products Co., Inc., 440 Fourth Avenue, New York 16, N. Y.

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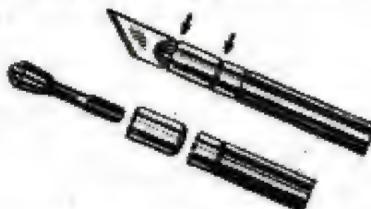
You Have

"The Last Word"

with X-acto!



To keep our Knives and Tools the "last word" in hobbycraft, we're always making them even better than they are. Here are some new points about X-acto Knives and Tools and how to enjoy them:



NEW CHISEL COLLET—Grips blade even more firmly, tightens it with less pressure, gives it a longer reach.



NEW BLADES—2 new chisel blades for working those hard-to-reach flat surfaces. No. 17 is $\frac{1}{4}$ " wide; No. 18 is $\frac{1}{2}$ ".



NEW BOOKLETS—(1) "Building Your First Flying Models". (2) "Whittling Is Easy With X-acto". Each 32-pages, illustrated, 10¢ a copy.



NEW TOOL—Small size Spokeshave for fine shaving, rounding, shaping where block plane can't reach. Solid one-piece handle, all metal and surgical steel blade. 50¢.

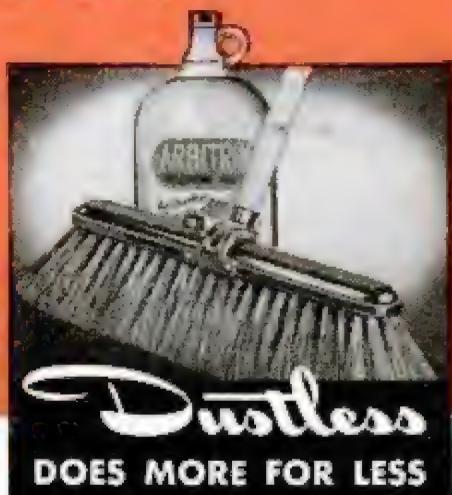


NEW SET—No. 85 Tool Chest, containing 3 all-metal knives, with full assortment of blades; saw; sander; stripper; planer; 2 drill holders; 10 drills; 6" steel ruler. Complete in wooden chest, \$12.50.

DUST INVITES GERMS



Ordinary dust raised in sweeping carries myriads of germs which can remain virulent for weeks and even months. That is one reason why thousands of factories, shops, stores, and schools are adopting "Dustless" sweeping. Daily sweeping with a Dustless brush and Arbitrin sweeping fluid reduces bacteria in the air as much as 97%. You ought to know all about this better method of sweeping. Write for complete facts today.



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- Dustless
- Speed Sweep
- Speed Wash brushes

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BRUSH COMPANY**

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brings \$30 and more a hundredweight—and it's worth it, the prospector says, after totting a 90-pound piece on his back for three-quarters of a mile to his truck.

Another noted gem prospector is Chuckawalla Slim, who carries several tons of rare rocks in a long yellow trailer which serves as traveling museum and store. This load is just a sample, for he has a much larger stock in his Alhambra, California, home, where he conducts a world-wide mail-order business with collectors. He was the first mineral dealer to bring his goods direct to the customer's doorstep, and he says he carries every known kind of stone except gallstones!

Flying Water Bugs

(Continued from page 100)

but racing rules forbid such vanes. Besides, such a hull would be considered as much an airplane as a boat.

Time trials for new records are clocked by photoelectric timers that are far more accurate than manually operated stopwatches. Drivers use water speedometers for testing out their boats in practice runs, but they remove the attachment before going into competition. The underwater drag would slow them down.

Another way a driver estimates his speed is by how much he "cries." A speed boat racer will tell you that "crying speed" starts at about 60 miles per hour and that drivers cry more as they go faster. This is because most of them dislike wearing goggles. Spray may splatter the glass just as vision is needed for watching the starter's flag or for rounding a marker in traffic. They prefer to race with their eyes unprotected even though the wind makes them weep as they approach mile-a-minute speed.

The fastest water in the United States seems to be that of the Salton Sea in southeastern California, 250 feet below sea level. It has an extremely high specific gravity as its mineral content is much greater than that of sea water. Both the heavy water and the heavy air contribute to speed, although motors and propellers must be "tuned" to these conditions. Twenty-one of the present world records were set at the fall regattas conducted by the Associated Speedboat Clubs of Southern California at Salton Sea, with entries from most parts of the U. S. A.

Man's highest speed on the water is 141.74 miles per hour, a record set in 1939 by Sir Malcolm Campbell in a special three-point hull powered by an aircraft-type Rolls-Royce engine developing 1050 horsepower.

All of the recent refinements that con-

(Continued to page 246)

NO-BATTERY FLASHLIGHT

ARMY AIR FORCE SENSATION

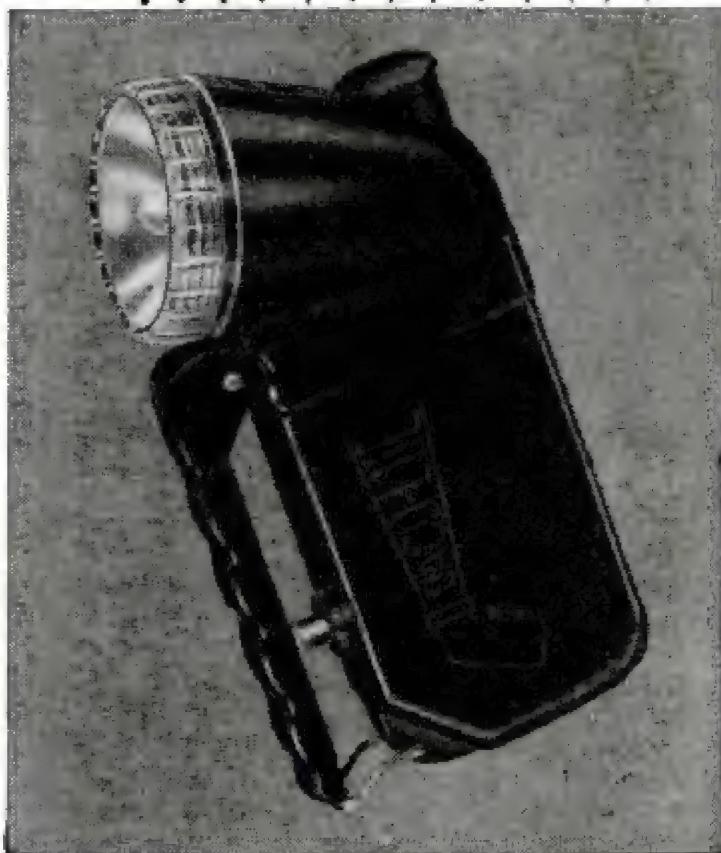
The Light Everlasting

The army airmen dared not rely on batteries—because a dead flashlight might mean a dead flier. Then came DACO-LITE—the magic light that generates its own brilliant beam without batteries, the patented light that bears a LIFE-TIME GUARANTEE. Shock-proof, corrosion-proof, cold-proof, heat-proof—never-failing. Built with precision of fine watch; war-tested, absolutely fool-proof, trouble free; money back if not satisfied. Sure fire in every emergency.

LIFETIME GUARANTEE

Lifetime service guarantee by makers; you take no chances. Colorful plastic case, streamlined; fits palm of hand. Each light carries "spare" bulb inside; send only \$4.95, check or money-order (we pay postage) to SCIENCE ASSOCIATES, INC., 65 Sena Plaza, Santa Fe, New Mexico.

HALF MILLION DELIGHTED USERS



SMOOTH Alternate Firing

A sweet running motor is half the fun of boating. That's why you surely want Johnson's Perfected Alternate Firing. It gives you that silken-smooth flow of power that makes Sea-Horse motoring something special!

DUAL CARBURETION

You've heard of the motor that packs real power—smooth power—at high speed, yet gives you velvet smoothness at a crawl? That's Johnson. Johnson Dual Carburetion (one of the "big three" of outboard motoring) accounts for this beautiful performance.



with REVERSE
and 360° Steering

Of course you need reverse. Reverse is one of the "big three" of Reverse motoring. Sea-Horses have it. Steer forward, sideways, turn around or back up. That's maneuverability!

JOHNSON SEA-HORSES

FOR DEPENDABILITY

Free~

HANDY CHART



Sea-Horses are strictly quality motors—built with dozens of refinements. In addition to the "big three" described above, there is Patented Co-Pilot which "takes hold of the motor when you let go," Synchro-Control for one lever operation, Ready Pull Starter, Rubber Rotor Force Pump—and much, much more. » There is something else, too, which is mighty important. That is expert Johnson service—available wherever outboard motors are used. » See your Johnson dealer. Look for his name under Outboard Motors in your classified phone book. Or write for a copy of the Sea-Horse Handy Chart which gives specifications on the entire line.

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It takes far-sighted engineering and superlative craftsmanship to build a radio receiver which will not become obsolescent in a year or two. National's famed HRO model first won its spurs in 1934 and hundreds of those early models are still giving dependable service all over the world.

The new post-war National HRO naturally contains many advanced, war-tested features not embodied in the earlier models—features which will insure its continued leadership in the field of radio reception.

For further details about the HRO, the NC-2-40C, the NC-46 and other National radios which bring you the finest in radio reception, see your local National dealer.



NATIONAL COMPANY

EST. 1914
MALDEN, MASS.

THE MOST DISTINCTIVE NAME IN RADIO COMMUNICATIONS

tribute to speed can be applied to racers of unlimited specifications, suggesting that a new world record of around 160 miles per hour is possible by using one of the new liquid-cooled high-powered engines of 2000 or more horsepower that were developed for aircraft during the war.

Top speeds that approach 200 miles per hour no longer seem impossible if airfoils or hydrofoils are used to prevent boats from actually taking off from the water during their runs.

"Operation Crossroads"

(Continued from page 93)

and close automatically to trap particles from the radioactive cloud that results.

Phase two is scheduled for July, when a bomb will burst at the surface among the remaining target ships, probably creating waves 100 or more feet high. Phase three, a deep underwater explosion at open sea, won't take place until 1947 because of the many technical difficulties involved, according to Admiral Blandy. Indications are that the bomb will be radically modified for this final effort and put in a watertight container, perhaps something like a bathysphere. Many believe the deep-water blast will be the most destructive and by far the most important if the bomb is detonated at least a third of a mile under water, producing the only completely unknown and unmeasured effects. It is expected to be the most effective in area of damage.

The principal ships, with the exception of the crippled Japanese battleship Nagato, will move to the test site under their own power. At Bikini they will be anchored in a spread-out pattern calculated to give effects varying from probable destruction, for those near the core of the target, to little or no damage for those at the perimeter. Task force officials explained that both large and small ships would be divided up so that some of each type would be equally exposed to damage.

Limited quantities of ammunition will be left aboard in order to determine the effects of atomic power on a warship's magazines. The decks of some ships will be covered with Army trucks, tanks, weapons, clothing, rations, radar and radio sets, and other miscellaneous equipment to be tested by exposure to the blasts.

At predetermined safe distances from the explosion will be stationed the official observation ships, including the USS Mt. McKinley with the task force staff aboard, and planes carrying additional visual observers and long-range aerial cameras to

(Continued to page 248)

For Men who Really Know Pipes



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Royalton CROWN

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**\$1 RIDS YOUR LAWN
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Destroys Ugly Weeds but Won't
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NO MORE back-breaking digging! Destroy ugly leafy weeds with WEED-NO-MORE!

The 8-ounce lawn-size package treats 1600 square feet! Now you can enjoy a beautiful weed-free lawn for *only \$1!*

WEED-NO-MORE kills dandelion, plantain and other ugly weeds—yet won't injure soil.

Get it today! Rid your lawn of ugly weeds for *only \$1.* Just spray on . . . WEED-NO-MORE!

On Sale at Paint, Hardware, Garden Supply, Department and Drug Stores

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THE AMAZING NEW WEED KILLER

Made by THE SHERWIN-WILLIAMS Co., Cleveland, Ohio

"Adventures in Fishing"



That's the title of a new P & K Booklet that is just off the press, is now ready for distribution. Splendid articles by Cal Johnson, well known outdoor writer and fishing authority, on Boys and Fishin', The Sport of Bait Casting, Angling for Deep Water Bass, and Game Fish on The Fly Rod make this booklet of real value to all fishermen, experts and amateurs alike.

In addition, this booklet illustrates in full color, the complete 1946 P & K Line of Tested & Proved Lures and Fishing Accessories. Such outstanding new lures as Walkie Talkie, and Bright Eyes are shown in 8 beautiful color patterns—Spinning Minnie in 4 patterns. Truly a DeLuxe booklet, each of its 32 pages crammed full of interest to fishermen. This is a booklet that you **MUST** have, and will treasure after you receive it.

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Send 10c, for which you will receive a regular 10c package of Rap-a-Round, the Invisible Ribbon Sinker, a necessity in every Tackle Box—and a copy of this new, amazingly beautiful and instructive booklet. Be first. **SEND YOUR DIME TODAY.**



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Smooth operating and sturdy, the No. 155 Millers Falls grinding head will give years of perfect service in your home workshop.

Here are a few of its many features: designed to drive from above, behind, or below . . . has "Oilite" bronze bearings, a $\frac{3}{4}$ -inch spindle, and carries two wheels up to seven inches in diameter, a $\frac{3}{8}$ -inch capacity chuck and a taper thread spindle . . . bearings are lubricated through good-sized spring top-oilers.

A complete line of heads is offered by Millers Falls to meet every grinding and polishing need. All are rugged, modern in design, and of advanced construction. All will make your work easier and quicker. See them at your dealers today.

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record the scene. Pilotless "drone" planes equipped with automatic cameras will hover nearest the fleet to try for closeups of radioactivity.

Still other motion picture cameras, controlled from ships and planes, will film the experiment from lead-shielded shelters atop 100-foot steel and concrete towers on the islands ringing the atoll. Inside this heavy housing the cameras will be in air-tight, waterproof cases fitted with windows. The photos will be shot through the win-



Preparing to lift guns from USS Nevada, another old battleship being readied for atomic bomb tests. During this war she fought in both Atlantic and Pacific

dows, further protected by portholes that will flip open just for the instant the action is filmed.

Every precaution will be taken to shield the cameras from the small radioactive particles that might drift through openings and damage the pictures. Photographic film requires better protection than do human beings, because the emulsion is very sensitive to fogging by even a slight excess of radioactive rays. Special filters that

(Continued to page 250)

The word for it is Performance!



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Just imagine the sheer delight — the gay and happy carefree feeling that comes with wearing this 17-jewel master timepiece! Croton Aquamatic is one watch you don't have to "baby". You just strap it to your wrist and forget it, except to consult it with absolute confidence whenever you want to know the time. You never have to wind your Croton, because it winds itself just by the natural motions of your wrist as you wear it!

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Croton SELF-WINDING

WATERPROOF AQUAMATIC

screen out hot rays will afford another check against damage from the heat of the explosive flash, which will be millions of degrees Fahrenheit. It may be several weeks after the test before any human beings can approach the camera towers because of radioactivity in the water.

On-the-spot-observation also is planned by television, with transmitters located in protected shelters on the atoll about five miles from the explosion sending images to screens on the task force flagship and the press ship, both approximately 20 miles distant. Some thought has been given to placing a transmitter in the nose of the B-29 dropping the bomb, but this possibility probably will be discarded because of the large amount of technical equipment the plane will be required to carry.

Every known scientific technique and item of equipment to observe, measure and record the effect of the three bombs will be utilized. Specially built instruments for this purpose will be installed on the ships themselves, to be recovered by divers in the event the ships are sunk in the shallow bay. Goats, sheep and pigs will be tethered aboard the target ships to serve as stand-ins for human beings. This is expected to add to our present extremely sketchy knowledge of the biologic effects of the blasts.

There will be repair facilities for ships damaged but not sunk in the first test, while salvage crews will make seaworthy any targets which could be returned to the United States after the second trial. They also will destroy any battered ships which might be hazards to navigation. Adequate safeguards will be established to protect all engaged in the test, observers, chance sea and air travelers, as well as inhabitants of the area, from the deadly radiation of the atomic bomb. Special protective gear, still on the secret list, has been devised for all personnel. The Bureau of Fisheries has stated that the test area is not the location of a spawning ground and the damage to fishing resources will be very slight.

A board consisting of two civilians, two Army men (one an aviator), two Navy representatives (one an airman) and one representative of the Manhattan District will evaluate the results and also analyze the report that the task force commander is required to make. The board will report directly to the Joint Chiefs of Staff.

"Operation Crossroads" is the code name for the epochal experiments, deliberately chosen, Admiral Blandy explained, because of its "possible significance"—that seapower, airpower and, perhaps, humanity itself were at the crossroads. And the Pacific tests may supply the answer!



Ford's out Front

WITH THE BIG 100 H.P. V-8 ENGINE

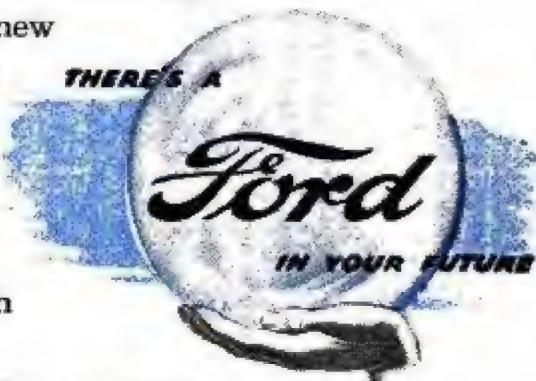
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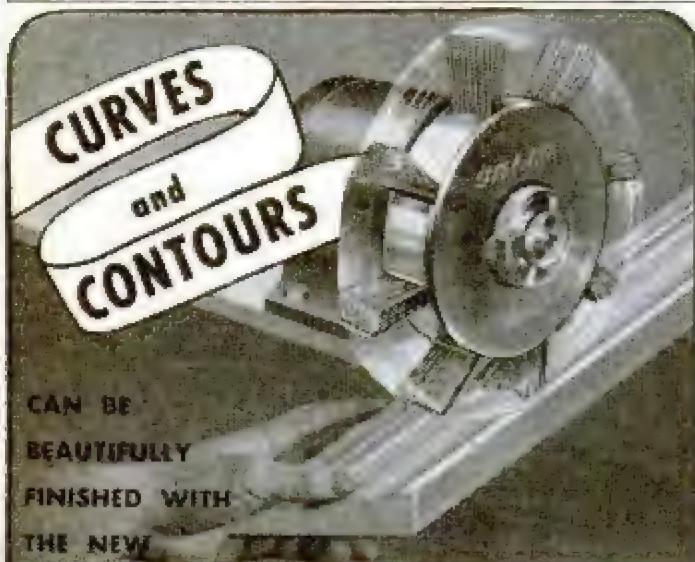
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**New All-Purpose
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We are now making deliveries on MOTO-SCOOTERS. Amazing new improved MOTO-SCOOT world's most economical form of motorized travel—up to 80 miles per gallon! Completely enclosed package compartment. Both "Solo" and "Delivery" Models ideal for utility and sport. To assure prompt delivery place your order at once. Write for colorful illustrated booklet giving full details.

AMERICAN MOTO-SCOOT CO., Dept. 4PM
3305-23 W. Carroll Ave., Chicago 7, Ill.

Thompson
BEATS
the World
on BOATS



Safe Boats With
Full Length Spray Rails

Keep passengers perfectly dry—even at high speeds. Catalog also shows two new models of "Take-Along" Boats. Two big factories—save you freight.

CATALOG FREE

Write for your copy. State kind of boat in which you are interested.

THOMPSON BROS. BOAT MFG. CO. (151)
213 Ann St., PESHTIGO, WIS. (Write to other places)

Better Built
Lower Prices

Canoes

Rowboats

Outboards

Light Boat for Auto
113 Elm St., CORTLAND, N.Y.

THE MAKING OF

Marlin GUNS

Marlin brings to sportsmen, through this series of advertisements, interesting facts on gun-making—to enhance appreciation of fine sporting firearms and to encourage their thoughtful handling and care.

RIFLE'S HEART • Inventive genius and fine craftsmanship mark firearms actions which have stood the test of time. The action is the main "works" of the rifle. Mechanism which carries cartridge from magazine to chamber...locks action...strikes firing-pin...pulls out and ejects cartridge...is so compact that it fits into a man's hand. All working parts are heat-treated for lifetime wear. Assembling is entrusted only to craftsmen of great experience and skill. All actions are tested before shipment.

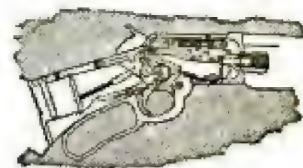


Assembling action of the Marlin 39-A Rifle.

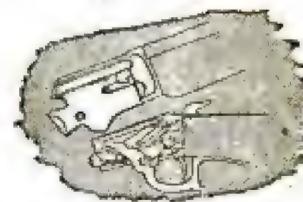


Testing actions at Marlin Firearms Plant.

SOLID TOP RECEIVER • A major advance in firearms design and the invention of J. M. Marlin. Solid top permits lowest possible mounting of telescope sight. Cartridge cases are ejected at side, cannot fly in shooter's face.



AT RIGHT are shown the "insides" of the Marlin 39-A Rifle. Its famous action has been continuously improved over half a century. Note solid top receiver, simplicity of mechanism.



ALL WORKING PARTS of Marlin's 39-A are exposed for cleaning and oiling by turning a single take-down screw. This Marlin is the only lever-action, .22 cal. repeating rifle made.

(The next advertisement in this Marlin series will reveal more interesting facts on fine gun-making.)

THE
Marlin
FIREARMS CO.
NEW HAVEN, CONNECTICUT, U.S.A.

BE SURE TO SEE MARLIN 1946 MODELS
ON DISPLAY AT YOUR DEALER'S

"1001" Re-Blade Knife*

with interchangeable surgical
steel blades!



"1001" Knife
as above, \$1.29
Knife with 3
extra, differ-
ent blades
and honing
stone, \$1.59



The first really "balanced" craft knife

Whether you're an expert craftsman or just a passably fair workman or hobbyist, you'll do better work faster and easier with "1001"—the re-blade knife of 1001 uses! For "1001", thanks to its light, perfectly balanced, colorful plastic handle, is second to none for easy and exact whittling, chiseling, modeling and cutting of all sorts. Its patented, scientifically designed chromium finish blade holder simplifies the insertion and removal of "1001's" all-purpose blades, and keeps them firmly locked in place. Yourself—get a "1001"—feel the difference, see the difference in your work. It's as easy to handle as a pen or pencil.

- Buy "1001" wherever hobbycraft tools are sold. If your dealer cannot supply you, send check or money order for \$1.29 (or \$1.59) direct to

SOMAR SPECIALTY CORP.
Dept. M12—630 Fifth Ave., New York 20, N.Y.

*PAT. PENDING

Say you saw it in Popular Mechanics

Test-O-Lite

THE MODERN
TROUBLE SHOOTER



THE NEON GLOW

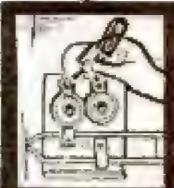
LOCATES TROUBLE INSTANTLY in electric circuits, fuses, cut-outs, motors, radios, appliances. Tests everything electrical from 100 to 550 volts. Indicates hot or grounded wires. Tells AC from DC. Engineers prefer it because it has patented safety features.

PUTS "FINGER" ON THE TROUBLE SPOT -- QUICKLY

Far superior to ordinary clumsy test bulb. Saves precious time. Indispensable in shop or home. Vest pocket size. Lifetime guarantee. List \$1.50 (Pat. No. 2,778,883) Purchase through regular electrical dealers.

L.S. BRACH MFG. CORP.

200 Central Ave. Newark, N.J.



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MOTORS



OUTLETS

LARSON for Leather

HANDICRAFTS HEADQUARTERS

Make Belts, Moccasins, Purses, Gloves and other useful things for profit

We regret that our stocks are incomplete for the time being.

Send 10c for catalog

J. C. LARSON & CO.
180 N. WACKER DRIVE — DEPT. D
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HAUCK FLAME GUN KILLS WEEDS



2000° F controlled heat quickly, easily destroys seeds, roots, brush, poison ivy, wild morning glory, Canada thistle, other unwanted growths. Many uses: splitting rocks, burning stumps, sterilizing poultry houses. Burns kerosene. Does the work of 4 men. Safe, easy to use. 10 day trial. Satisfaction guaranteed. Free catalog.

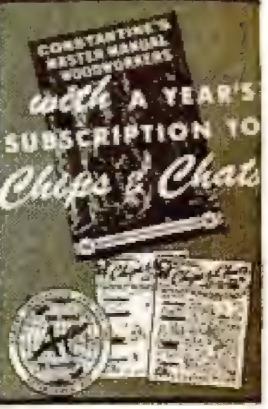
HAUCK MFG. CO.

121 Tenth St. Brooklyn 15, N.Y.

KEEP YOURSELF UP-TO-DATE ON WOOD VENEERS LUMBER & SUPPLIES

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Published by the leading suppliers to woodworkers, the most complete book ever offered. More than a catalog, contains valuable information on lumber inlays, veneers, woodfinishing, etc. 88 inlay border designs in full color, 6 pages of full color inlays plus a wood identification chart showing over 60 rare woods in natural color. Send only 25¢ today and we will include FREE a year's subscription to our publication, *Chips & Chats*.



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- the COLOR is right in it
- EASY TO APPLY!



**BUY TREMCO
MASTIC-GLAZE**

at Hardware, Paint & Dept. Stores

A TOOL—
NOT A BRUSH

PAINTERS' STRIPING

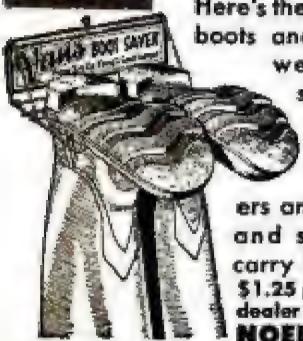
TOOL

ONLY
\$1.00
POST
PAID

As easy to use as a pencil! Draws parallel lines, straight, curves, circles with paint, enamel, lacquer. Use to stripe autos, furniture, toys, bikes, model planes, signs, bulletin boards, linoleum. (Makes wall board look like tile.) Every painter and craftsman should own one! Type "g" MASTEE Painters' Striping Tool with instructions, adj. guide, 1/16" tip, complete only \$1.00. C. O. D. 25c extra. Order Today! PAINT DEALERS! WRITE FOR LITERATURE, ETC.

WENDELL MFG. CO., 4234-B, Lincoln Ave., Chicago 18, Ill.

Vana's BOOT SAVER



Here's the smart way to dry your boots and other outdoor footwear quickly—also to store them to save folding and prolong life. Indispensable to hunters, fishermen, farmers and all outdoor workers and sportsmen. On trips carry in coat pocket.

\$1.25 prepaid in U. S. A. if your dealer can't supply you.

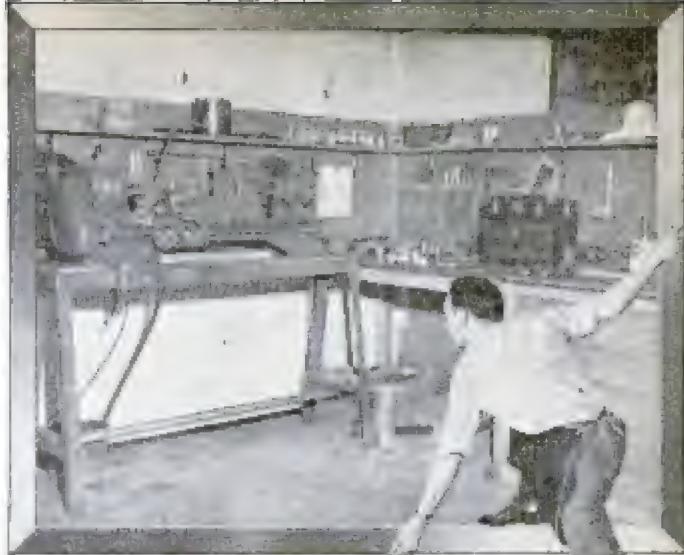
NOEL VAN TILBURG CO.

3029 Washington Ave. S. E., Minneapolis 14, Minn.

**SIGNS
AND
SHOWCARDS** EASILY AND EXPERTLY PAINTED WITH LETTER PATTERNS
MANY SIZES & STYLES. WRITE FOR FOLDER.

JOHN F. RAHN
1231-1233 N. Central Ave.
CHICAGO 51, ILL.

Say you saw it in Popular Mechanics



**GET INTO THIS
HAPPY PICTURE**

A well equipped home shop is the dream of many a man. It's the best hobby of all if you like to use tools. Most practical, too, when you consider the hundreds of useful articles you can make for your home—and the time and money you can save by repairing your own home appliances and equipment.

Atlas tools are ideal for such a shop—engineered for precision workmanship, and ruggedly constructed to give you a lifetime of service. They are built with modern production techniques to give you exceptional values.

Long-standing industrial reconversion orders will soon be filled. Keep in touch with your Atlas distributor.

Send for this fully illustrated catalog to make your plans.



ATLAS PRESS CO.

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KALAMAZOO 13D, MICH.



6"-10" Lathes



Milling Machines



Shapers



Drill Presses

SWIVEL-HEAD

FLASHLIGHT

nothing else like it!

HEAD TURNS
LIGHT AT
ANY ANGLE

Greatest advance in flashlight design in a generation. Turn powerful pre-focused beam where you want it . . . stand it up . . . clip it on . . . both hands are free. A handsome, durable, all-purpose flashlight for everyone. Ask your dealer.

\$2 LESS
BATTERIES

USALITE

No. SW-22
Patented

No. 75 Heavy-Duty Dated Cell. Fresh Lasts longer. 10¢

Flashlights & Batteries

If dealer cannot supply, send \$2.00 to Dept. P
UNITED STATES ELECTRIC MFG. CORP., New York 11, N. Y.

*USALITE Red-Head Safety Flashlight—a "MUST" for the motorist.

GI's with bazookas, tommy guns, rifles—machine gunners, anti-tank crews behind the famous M12—155mm "Long Tom"

KEEP A CAN OF BOTH ON HAND!

Heavy 3-IN-ONE

Refrigerators, mixers, motors, power tools, lawn mowers, ironers,



For over 50 years America's accepted household oil!

SOLD EVERYWHERE IN 1 AND 3 OUNCE CANS

Guaranteed by Good Housekeeping



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Sweepers, sewing machines, hinges, guns, locks, metal drawers.

3 - IN - ONE Oil

WRITE
For
FREE
Literature

BUILD YOUR OWN POWER LAWN MOWER



WHY BREAK YOUR BACK MOWING FIELD OR LAWN?

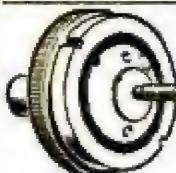
Now anyone can save time and effort mowing field or lawn, by building their own whirl type power mower.

We furnish complete information, and whirl type blade attachment. Write today.

T & H Mfg. Co.

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"WONDER" ELECTRIC BUTTON



Most interesting electrical apparatus ever discovered. Make you own Telephones, Amplifier Detectors. Transmit your voice or music to distant rooms. Perform hundreds of fascinating experiments. So tiny it can be concealed in dozens of places. Send \$1 now for button and free 5,000 word instruction booklet with 50 illustrated experiments. SPECIAL OFFER 6 buttons and booklet sent post-paid for 55.

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ENGINES IN STOCK: ONLY \$9.95



GHQ MOTORS, Dept. BX46, P. O. Box 193, Station D, N. Y. 11, N. Y.

The G. H. Q. miniature gasoline engine that really operates is available. Over 100,000 sold to date. 1/5 H. P. Complete with coil and condenser and full illustrated instructions for only \$9.95. Fully bench tested and ready to run. Power for all models. Send only \$1.00—Shipped Collect C.O.D. same day. Send for free Illustrated Catalog of hundreds of hobby items.

Authenticast SCALE MODELS OF TANKS AND SOLDIERS!

PERFECTLY CAST—ALL METAL

AUTHENTICAST scale models are scoring a direct hit with hobbyists everywhere! Ask your hobby dealer to show you the complete AUTHENTICAST collection of tanks, jeeps, scout cars, half tracks and soldiers. Tanks \$1.10 to \$2; Men \$1.85 box of 12 ass't'd. Scaled to match, 1 in. to 9 ft. Send 35c in coin for 32-page color catalog.

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COMET METAL PRODUCTS CO. INC.

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STOP LEAKS!

Cooling Systems
Made Leak-Proof QUICKLY

WARNER LIQUID SOLDER—Non-Metallic—Deposits Tiny Fibers to Repair Leaks Anywhere in Cooling Systems. Simply pour in! Finds and REPAIRS every crack or hole. Do it yourself—or see your service man.

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* Build These Cleveland Models *



* Lockheed "Lightning" P-38

* 38 $\frac{3}{4}$ " model of one of the AAF's most sensational fighters. \$4.00

* 36" Industrial Train. Model, Kit T-85.... \$1.50



Cleveland Tether "SHARPIE"

Lowest price line-controlled gas model yet offered. A, \$B, C, engines. Kit \$1.00 less motor and hwre.)

100.....



Boeing B-17 "Flying Fortress"

Known as most famous plane of World War 2. Perfect纪念品 of the AAF. 77 $\frac{1}{4}$ " span. MPM Kit \$P. 100.....

\$12.50

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CATALOG 5c (Circular free)

CLEVELAND MODEL & SUPPLY CO.
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REPAIR YOUR OWN ELECTRIC APPLIANCES

WITH NEW AMAZING NICHROCITE



Simply overlap ends, apply Nichrocite paste and turn on the current—a perfect weld results. Used by big utility companies and repair shops. Just the thing for that broken or burned out heating element in your electric iron, stove, toaster or heater. Does the job in a jiffy. Trial order. \$1; 4 ozs., \$2.50; 1 lb., \$8.00.

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Learn this easy, money making business from nationally recognized consultant. Small investment; perpetual market. For free details write Joseph B. Kushner, B.S. Ch.E., Metal Finishing Consultant, Stroudsburg, Pennsylvania, R.D. 3C.



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A TOOLSHOP IN YOUR HAND!

- GRIND • DRILL • ROUT
- POLISH • ENGRAVE
- CUT • SAND • SAW, etc.

Make Things From
Wood—Plastics—Metals—Glass—Linoleum—
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TOOL OF
1001 USES

Smooth, steady power at your fingertips! You can turn out professional looking projects for pleasure or profit—ship, plane or train models, costume jewelry, wood carvings, puppets, initialed tumblers, etc. Handee, first small portable tool and today's finest, uses 300 different accessories. AC or DC. 25,000 r.p.m. Weight, 12 oz. With 7 accessories, postpaid..... \$18.50



GET A GOOD START

Get the
HANDEE
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HANDEE Tool and 45 of the most popular accessories, all packed in handsome, compact steel carrying case. You'll be amazed at what you'll accomplish!

Complete, postpaid, \$25.00

FOR YOURSELF OR A FRIEND...
THE GIFT OF A LIFETIME!

HANDEE PRECISION ATTACHMENTS

Magically, easily, your offhand carving, routing, shaping, etc. will be perfect as to depth of cut, accuracy of line. These remarkable new tools for novice or experienced craftsman fit Handee only. Set of 6 attachments, with full instructions, complete, postpaid..... \$7.95



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64-PAGE
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 Remittance enclosed. Send C.O.D.
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Only Forecaster Superb Pipes have this

NON-FILTER

Cleans, cools, filters smoke •
Traps nicotine • Prevents drip

Enjoy a clean, cool, dry
smoke always from a
Forecaster • The exclu-
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Choice, rich-grained
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popular shapes. •
Ask to see the
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FILTERS
SMOKE
FROM
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TO TIP!

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Superior Quality ROTARY FILES

FOR HOME CRAFTSMEN

The nationally famous Ford Rotary Files, used for the past 25 years by leading precision manufacturers, are now available for the home craftsman in a handy dust proof case which contains six popular shaped tools.

The tools are made of the finest quality high-speed steel, hardened and tempered for maximum life. These ground cutters are efficient on steel, aluminum, brass, plastic or wood. The shapes will meet most home craftsman applications. These tools are made with standard $\frac{1}{8}$ -inch shank. Additional shapes and sizes are available.

Money with order prepaid
C.O.D. — postage extra

SIX TOOLS IN
Dust Proof Case \$6.25

M. A. FORD MFG. CO.

800 WEST FIRST STREET
RAVENPORT, IOWA

PLASTICS

There's fun and profit in making plastic jewelry, novelties, and furnishings, in your home workshop! We have every material you need — Plexiglas, Lucite, Bakelite, Lignolite, Tenite II, Lumarith, in a large variety of sheets, rods, tubes, and special shapes. Also dyes, cements and other plastics supplies and accessories. Send 10 cents today for complete catalog.

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AUTOMOBILE COMPASS

You're on the right course always with a HULL AUTOMOBILE COMPASS. No lost directions, backtracking, delays. Reliable for years, out of the war with improved accuracy. Ask your dealer for a HULL—the leader. Circular free. Price \$1.50.

HULL MFG. CO.

P. O. BOX 246-D5

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WORK BENCH

Ideal for hobbyist or shop worker, this sturdy, useful bench makes home handicraft a joy! Heavy top, 2 large drawers. Tool rack, strong shelf, bins for nails and bolts. 59" long — 23" wide — 36" high. Shipped unassembled, easily set up (from instructions). F.O.B. Phila. factory. Check or money order. Money back if not satisfied.



\$13.95

5040 WALNUT STREET

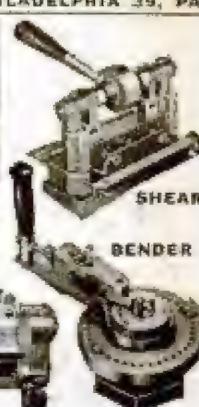
PHILADELPHIA 39, PA.

J. B. NOLAN, Dept. M

DIE-LESS DUPLICATING

Many small parts can be formed without dies, to duplicated accuracy of .001" with DI-ACRO Precision Machines.—Benders, Brakes, Shears. Save the expense and time delay. Ideal for experimental and research work, making samples, models, etc., as well as regular production runs. Write for descriptive literature.

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for Power that Zooms* in the spring..tra la!

● It's Spring again! And what a Spring—with gasoline galore and never-ending roads. With valleys and lakes, mountains and woodlands, all beckoning you to come on out and really live again.

It's what you've hoped for and dreamed about—and here it is, all yours!

But before you start out, you'll want Casite in your motor, whether it's old or new. Casite tunes up older motors—restores smoothness and power. And it protects new motors during the critical break-in period.

Casite carries oil quickly to the tight spots . . . retards for-

mation of sludge and gum . . . reduces engine wear . . . keeps motors clean and full of zip!

Millions of motorists have used Casite . . . and keep coming back for more. Put a pint in the crank-case every oil change and a pint through the air intake every three months. It's sold by service stations, car dealers and garages.

THE CASITE CORPORATION
HASTINGS, MICHIGAN

CASITE



BETTER AND SMOOTHER PERFORMANCE OR DOUBLE-YOUR-MONEY-BACK

GUARANTEE—Add Casite to crankcase and run through air intake according to instructions, then drive your car 100 miles or for 60 days, whichever is first. If not convinced that Casite gives you better and smoother performance, you get

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LIVE and TRAVEL in Comfort

SOLVED—your housing problem—with a modern, mobile, Schult Luxury Liner. Has every facility of a 2-bedroom home, scientifically arranged for comfortable living. Sliding doors afford 3-room privacy for guests or night-shift workers.

COMPLETELY FURNISHED

• Generous-sized wardrobes and drawers for clothes, linens, supplies. Oven cooking range, refrigerator, double sink make full meals easy. Built-in real bed, plus sofa-bed gives 2-bedroom utility.

See your Schult dealer today, or write for new booklet on 1946 models. SCHULT CORPORATION, Dept. 3204 ELKHART, INDIANA Member: TCMA. Attend National Trailer Coach Show, Chicago Coliseum Mar. 16-24

SCHULT Trailer Coaches



is a Good Business

With the Foley Automatic Saw Filer you can have a fine cash business with steady customers and make a good living. The Foley automatically joints the saw, making all teeth even in size, shape, spacing. The Foley is the only machine that files all hand saws, also hand and cross-cut circular saws.

SEND FOR FREE PLAN—Shows how to start a saw repair shop. No encumbrance. Send coupon today.

FOLEY Automatic SAW FILER

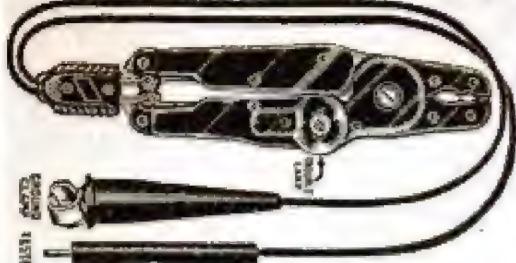
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416-6 Foley Bldg., Minneapolis 13, Minnesota
Send Free Plan on Saw Filing business, no obligation

Name _____

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Fuse Puller—Circuit Tester



For
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or
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TESTS 110-250 VOLTS

When motors stop and lights go out, this tool quickly LOCATES DEAD CIRCUITS and safely removes blown Fuse. The Star Test Pocket Plier is made of a Transparent Plastic having in one of the legs a small lamp in series with a resistance and can be used to test 110 to 250 volts circuit. The Plier will pull fuses from 10 to 100 Amperes. Thousands of Electricians find this tool handier than Test Lamps. Price \$2.75 each without Leads, \$1.50 additional for Leads. Can be obtained from General Electric or Westinghouse Stores or from your local dealer or jobber. Order NOW. STAR FUSE CO., 235 Canal St., New York 13, N. Y.



Made From IMPORTED BRIAR

BULLDOG SADDLE

Enjoy unmatched sweet smoking quality, outstanding fine grains, in modern designs.

Write for FREE illustrated booklet. **\$3.50 to \$10**

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Hobby Room to Upstairs... Basement to Attic



TWO-WAY INTERCOM SYSTEM

Now Priced Within YOUR Reach

Saves endless steps. Clear reception to 1000 ft. Beautiful steel cabinetry; 3-tubes; send-receive button; 110 AC. Mailed Cash or C.O.D.

VINCE ANDERSON COMPANY
20 Ross Ave., Fort Mitchell, Ky.

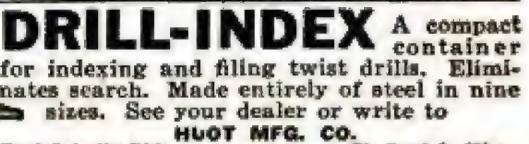


MARCOT KEY MACHINE



Marcot No. 8 Key Machine Mounted on Cabinet.....	\$ 75.00
Book on Modern Locksmithing.....	3.95
Auto Code Book and Depth Keys.....	12.50
250 Assorted Key Blanks.....	77.76
Set Key Files, Tools, Pins, Springs, Thimble.....	10.50
	\$179.71

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DRILL-INDEX A compact container for indexing and filing twist drills. Eliminates search. Made entirely of steel in nine sizes. See your dealer or write to

HUOT MFG. CO.
Foot Schultz Bldg., St. Paul 1, Minn.



KEEL-GUIDED BOAT ROLLER

PAT. PEND.
FOR BOATS and CANOES. Easily mounted to dock, pier, trailer. Boat rolls on even keel, simplifies handling. Cut damage and repair cost. Rollers of hard durable rubber. Assembled ready to use, \$7.95, F.O.B. FREE FOLDER. See your dealer or order from BERG'S Madison 4, Wis.

SAY YOU SAW IT IN POPULAR MECHANICS

Mows and Trims Lawns



In One Simple
Easy Operation

8 1/4 Lbs.

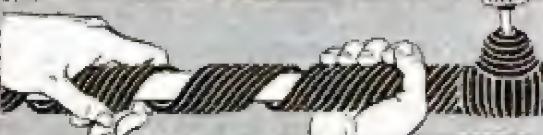
Save Time
and Labor with a
MONTAMOWER

New model. New type metal handle has special device to adjust cutting height. Drive shaft now mounted on free rolling, factory lubricated, and sealed ball bearings. No tired backs or aching arms. 8 1/4 lbs. of live precision made mechanism that first gathers, then cuts smoothly a clean 16" swath through grass, dandelions, spike grass and weeds. No noise or clatter. As modern and efficient as your electric razor. Cuts right up to walls, fences, trees or posts; leaves no fringes to be trimmed by hand. Cutters are self-sharpening. Built to last many years. Many thousands in use. Sold direct from factory. Costs little. Write at once for guarantee information and literature.

MONTAMOWER DISTRIBUTING CO.
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STOP THAT DRIP

NoDrip
TAPE



EFFECTIVE IMMEDIATELY

New—for homes! A sure cure for condensation drip from cold water pipes. Pliable, cork-filled NoDrip Tape eliminates wet floors, makes idle space usable!

Quick, Clean, Easy to Apply—No tools needed.

Covers joints as well as straight pipes.

At hardware, dept. stores, lumberyards.

\$1.25

Roll, enough for 7 feet of 1/2" pipe.

Higher west of Rockies and Canada

FREE CIRCULAR

J. W. MORTELL CO. 522 BURCH ST., KANKAKEE, ILL.



BRASS RODS

For Home Work Shops

For use on model boats, airplanes, etc., keep a supply of these free-tinning brass rods on hand. Each kit contains a complete assortment of sizes.

KIT 1 . . . \$1.00 KIT 2 . . . \$4.00

plus postage, 7 pds. plus postage, 5 pds.
12" long, 1/8" to 12" long, 1/8" to
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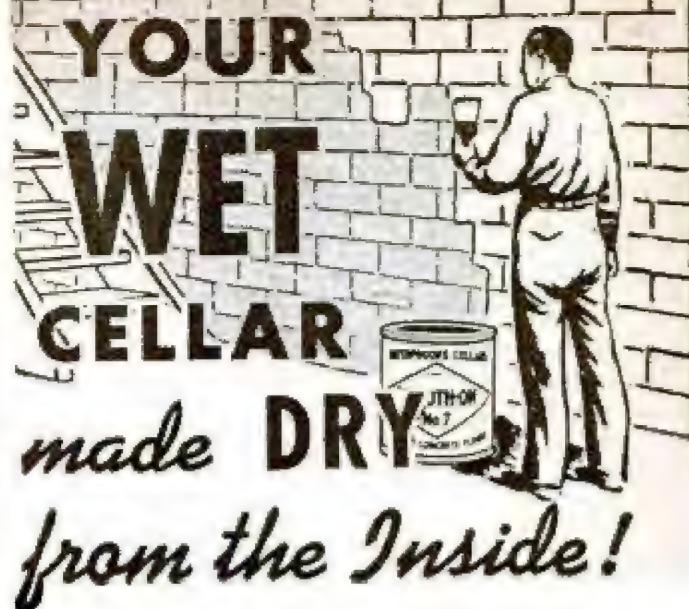
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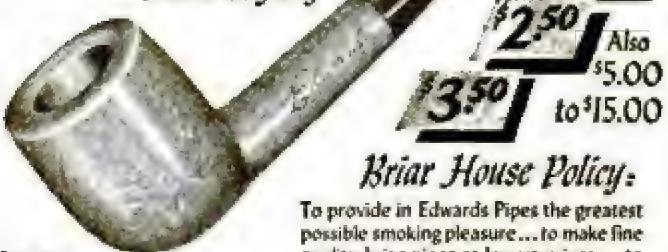
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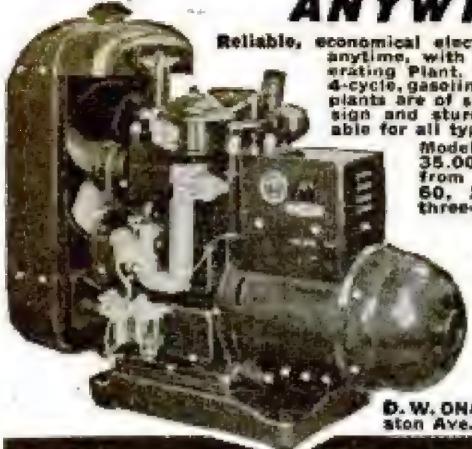
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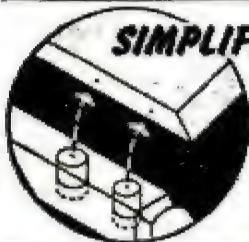
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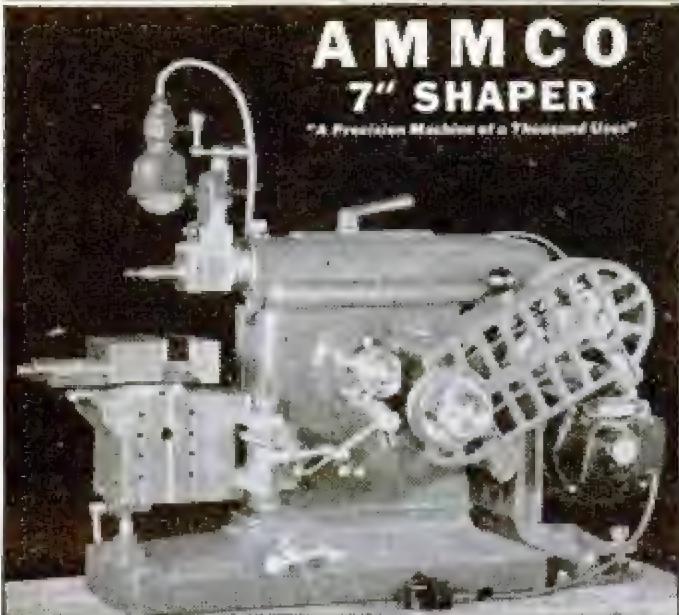
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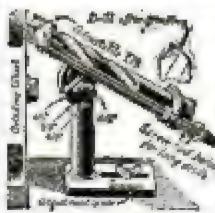
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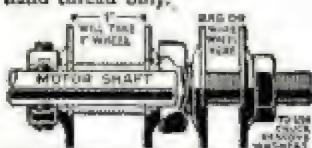
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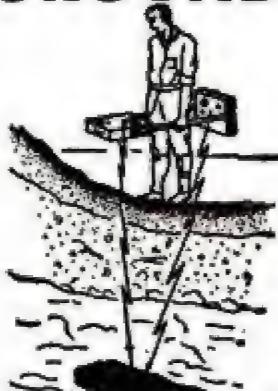
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Build up a route or sell the machines outright to Drug Stores, Taverns, Night Clubs, Pool Halls, Tobacco Stores, in fact any store

will welcome a 1c Match Vendor.

BETTER HURRY! SUPPLY LIMITED!

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Build up a route or sell the machines outright to Drug Stores,

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Streamlined, smart, sure-fire. Precision-made of gleaming hi-polish dural-aluminum. Triple capacity gives three times longer use without re-filling. Lightweight: $1\frac{1}{4}'' \times 2'' \times 7/16''$.

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for home users, mechanics, farmers, technicians! High speed steel blade cuts clean holes quickly. Fits drill press, portable drill or hand brace. Money back guarantee! At all hardware stores or write direct, Dept. PM-4.



Model No.	Shank Size	Cutter Expansion Capacity	User's Price
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100-B	Square Bit Shank	$\frac{3}{8}$ "-1 $\frac{1}{2}$ "	\$2.95
101	$\frac{3}{8}$ " straight shank	1"-2 $\frac{1}{2}$ "	\$4.95
101-B	Square Bit Shank	1"-2 $\frac{1}{2}$ "	\$4.95

Model No. 100

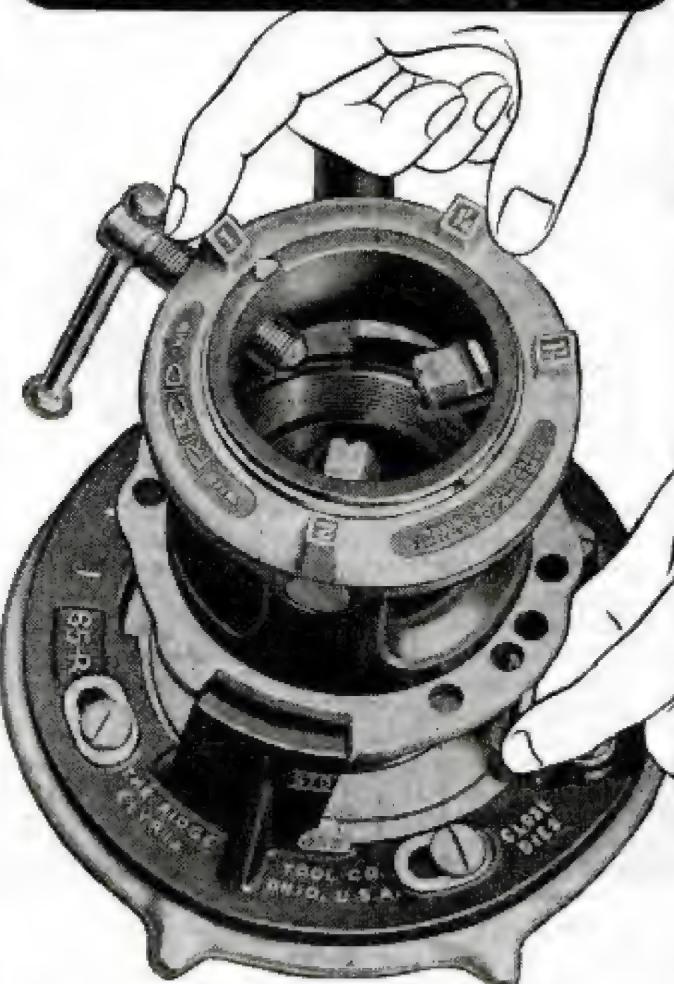
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BEVERLY HILLS, CALIFORNIA

You thread
1" to 2" pipe more
easily, quickly with
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• No wonder this threader is popular. It cuts perfect threads on 1", $1\frac{1}{4}$ ", $1\frac{1}{2}$ " and 2" pipe with new ease and speed. One set of high-speed steel chasers threads all 4 sizes—set to pipe size in 10 seconds. Workholder sets instantly—no bushings. For a smart work-saving tool you enjoy using, try this steel-and-malleable **RIDGID** at your hardware or supply house.

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COMET MODEL AIRPLANE & SUPPLY CO. INC.

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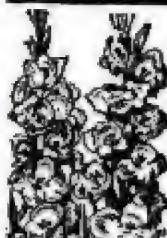
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25¢ each; 5 for \$1.00. Collar plates (5/8" x 2") 35¢; 8 for \$1.00. Key tags 25¢ each. We make tool tags, and tool box plates.

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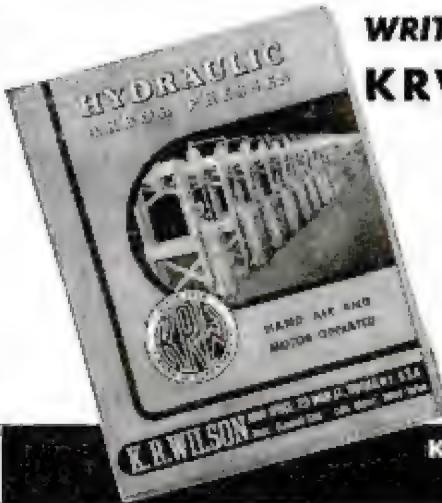
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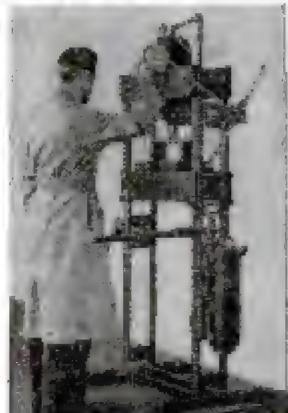
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PUT THIS "WAR VETERAN" TO WORK

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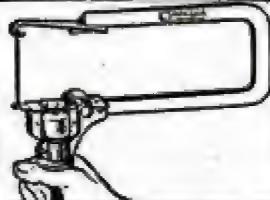
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| <input type="checkbox"/> Touching Up | <input type="checkbox"/> Polishing | <input type="checkbox"/> Cutting |
| <input type="checkbox"/> Sanding | <input type="checkbox"/> Burnishing | <input type="checkbox"/> Raspng |
| <input type="checkbox"/> Drilling | <input type="checkbox"/> Inlaying | <input type="checkbox"/> Carving |
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A brand new double spiral fluted design—ground from finest hi-speed Mo-Tung tool steel—with special radial shaped flutes for faster, smoother, easier routing, grooving, carving, and round-end mortising. Insures true, straight walls and smooth bottom surfaces. Extra long cutting flutes for deeper operations. The router bit that's different—AND BETTER. $\frac{1}{4}$ "-\$1.10, $\frac{1}{2}$ "-\$1.40. Set of 6 sizes up to $\frac{1}{2}$ "-\$8.25 shipped prepaid.



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5 sizes
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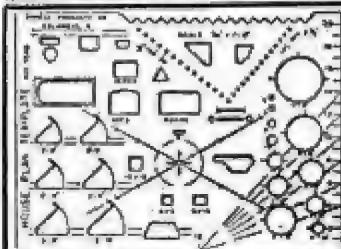
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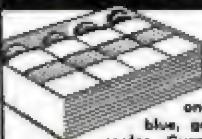
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Swiss movement, very handsome looking, durable chrome plated case. **SEND NO MONEY.** Pay postman \$8.50 plus postage and 10% Federal Excise Tax. Wear 10 days, money back if not satisfied.

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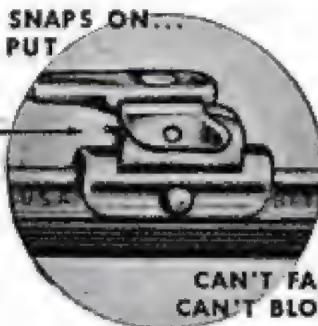
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"Dead-Locker"

WINDSHIELD WIPER ARMS and BLADES

BLADE SNAPS ON...
STAYS PUT

FINGER-TIP RELEASE



CAN'T FALL OFF
CAN'T BLOW OFF

(A war-born invention—by ANCO—first)
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DON'T SHOOT YOUR GAS-PUMP MAN!

He's doing the best he can. Sure, he knows how dangerous it is for you to drive your car... in stormy weather... with your dull old windshield wipers that smear and smear. He'd gladly put on for you quickly a pair of keen new ANCO RAIN-MASTER Wiper Blades and Arms. He has them—Newest Models! But he forgets to remind you? Too busy? You can't shoot him for that!



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FLUORESCENT
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Just Plug in and
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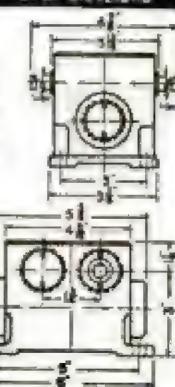
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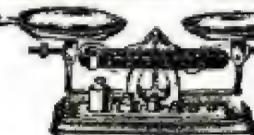
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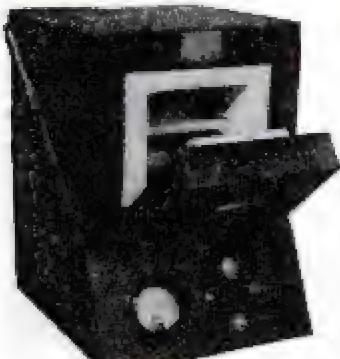


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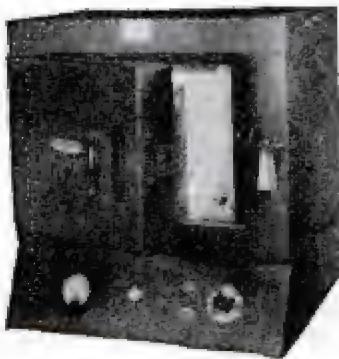
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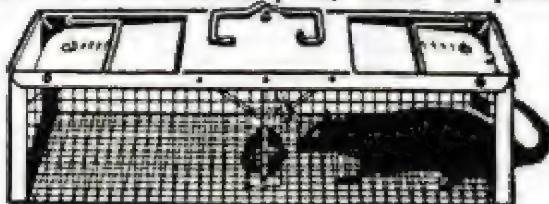


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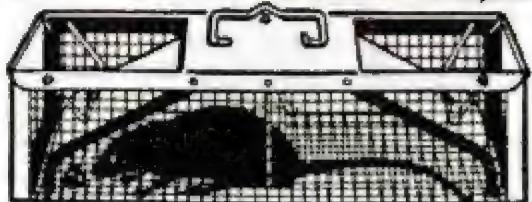
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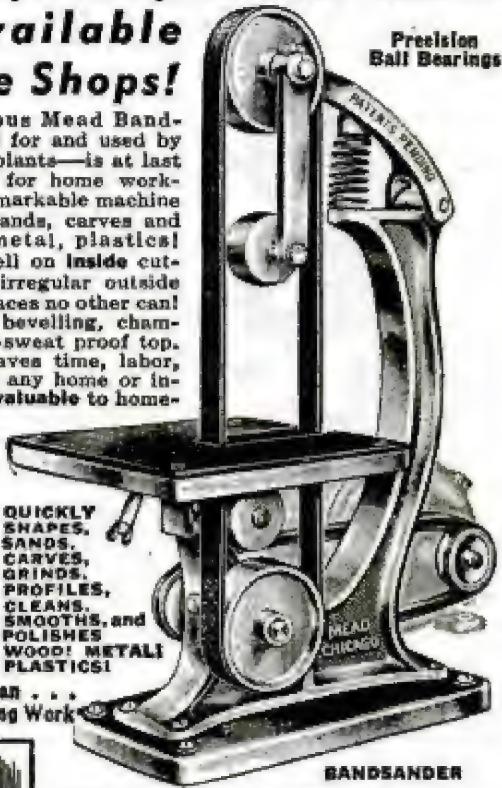
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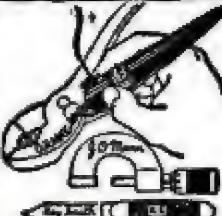
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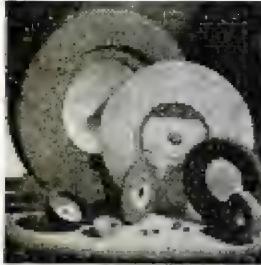
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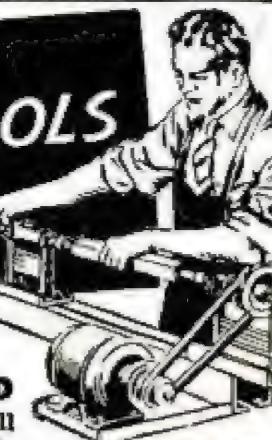
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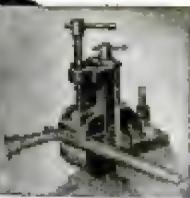
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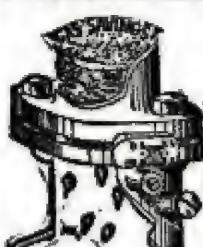
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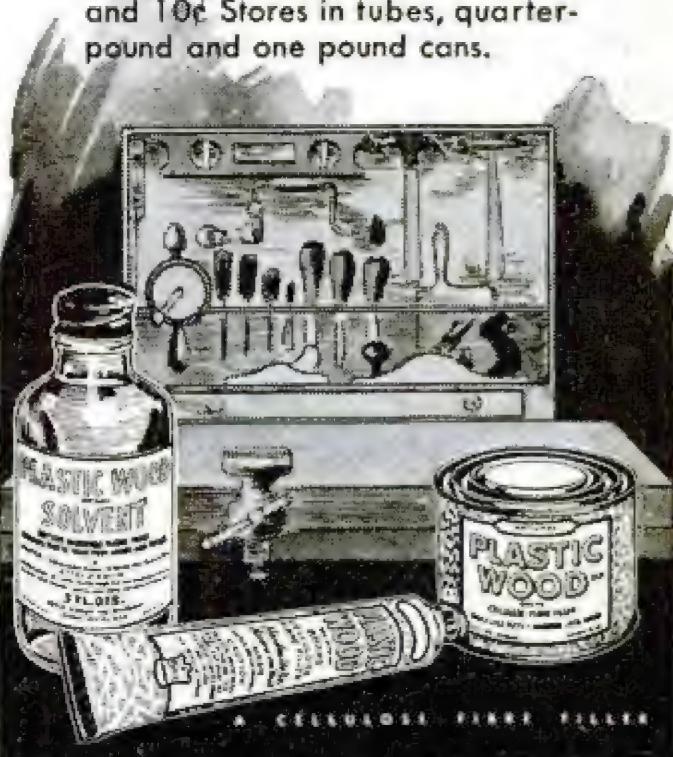
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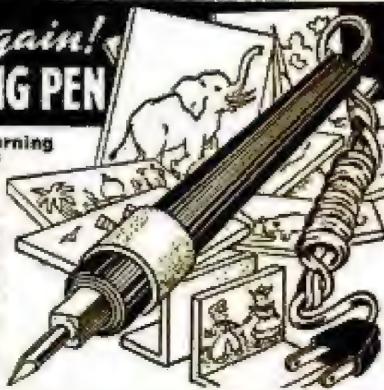
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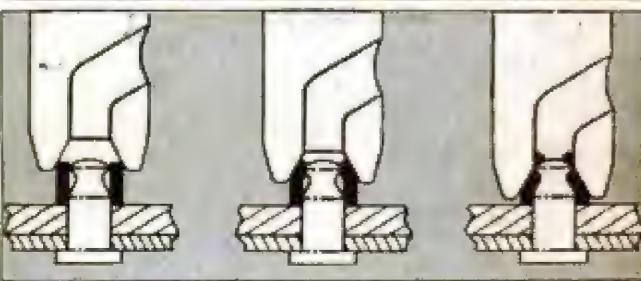


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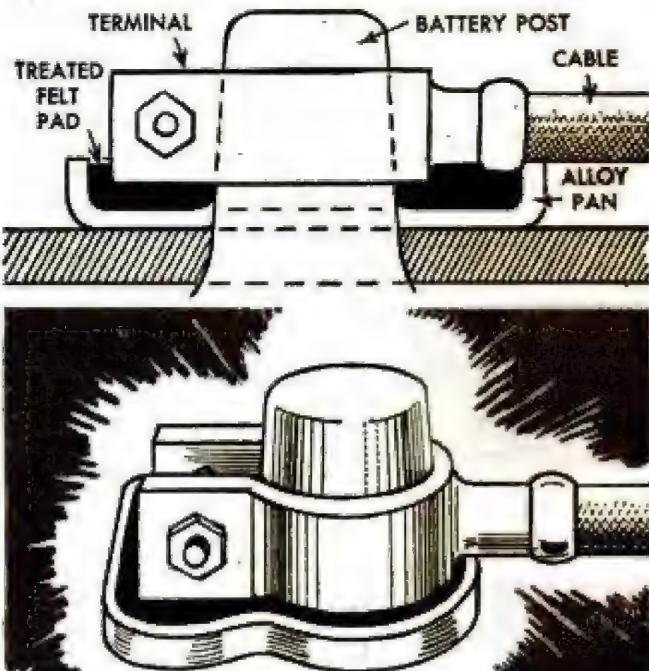
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N.Y.N.Y.
Hobbyist Builds With Toothpicks



Building with toothpicks is the hobby of 14-year-old Martin Roberts who showed his models of a Ferris wheel and the Eiffel Tower at a New York hobby show. For the Ferris wheel he used 27,000 toothpicks.

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FLEXIBLE WATCH BAND \$1 95

Feather-lite flexible stainless steel watch band—self-expanding to fit your wrist. Mirror finished! Beautiful! Order at this low price . . . EACH

AMERICAN MILITARY OUTFITTERS, 14 N. Franklin St., Chicago 2, Ill.
See our adv. for Shoulder Patches pg. 276—Longines Compasses pg. 287.

POST
PAID

UNITED WHEELS

\$1.98 plus postage. Wagon Kit, four 8 x $\frac{1}{2}$ " wheels, axle and fittings complete \$7.00 plus postage. Also available 10-8-4-5 Steel Ball Bearing Wheels. Order today. Cash, Money Order or C.O.D.

UNITED WHEELS MFG. CO., 11727 La Fayette Ave., Chicago 28, Ill.

Wheel Barrow Wheel KIT. One 7 x $\frac{1}{2}$ " rubber tired steel disc wheel, axle and fittings complete

OWN A BATTERY BUSINESS

We show you how to recast junk batteries into new. Latest Achievements

BATTERY LAB, MINNEAPOLIS 13, MINN.





\$4.25 pair

Plus 35¢ for Postage & Handling. Give Size. Higher in Canada.

SALES . . . SALES . . . EVERYWHERE . . . No matter where these outstanding 3 Wheel Roller Skates are shown they win instant approval . . . Lighter in weight makes for Easier Skating . . . The Streamlined principle gives more SPEED and Smoother Skating . . . For Rink, Figure and Sidewalk Skating . . . Fully Chrome Plated. EXCLUSIVE FEATURE: Has a Brake for quick stopping.

This is an unusual opportunity for QUICK, BIG VOLUME SALES and we want wide-a-wake Distributors and Local Agents to take care of this business in their territory . . . The interesting part of this BEB Skate is . . . It is interchangeable to Ice Skating in a few minutes . . . Ice Skate Attachment \$1.90 extra.

DISTRIBUTORS . . . AGENTS WANTED EVERYWHERE

We want every territory covered . . . Dealers are enthusiastic and order in large quantities . . . We want Go-Getters to supply this demand and offer a BIG MONEY-MAKING Proposition.

BEB SKATE CO., Dept. P4, 4529 Ravenswood Ave., CHICAGO 40, ILLINOIS

THE TRUTH ABOUT SHAVING

Just turn the crank
Smart shavers say . . .
To SHARPEN blades
The Barber's Way!



Twinplex makes double-edge blades barber-sharp by accurately flexing and strapping them on genuine barber-strop leather. "Just turn the crank."

The famous Twinplex Stropper will keep a keen cutting edge on your blades by mechanically stropping both sides like the barber manually strops his "straight-edge." MEN . . . it's not the brand of beard softener or blade that cuts whiskers off . . . it's the blade edge . . . and that's the truth! So keep that edge super-sharp. Use Twinplex for easy, quick, smooth, perfect shaves. Only \$2. Ideal for gifts. Ask your dealer for a demonstration today.

TWINPLEX MANUFACTURING CO., CHICAGO

OWNERS BRAG ABOUT
Twinplex
BLADE STROPPER
USED BY MILLIONS SINCE 1915



THREE BALL BEARING WHEELS in line gives MORE SPEED with LESS EFFORT . . . Simply raise the toe to STOP QUICK.

CHANGEABLE FROM ROLLER TO ICE SKATES

WORKSHOP WISDOM

Laminating waste stock for turning

MAKE use of your waste stock by laminating scrap pieces with CASCAMITE, because it's strong, stain-free, and highly water-resistant.



To laminate waste stock

Choose pieces of stock to roughly approximate finished size and shape. Plane surfaces to be glued so that they are perfectly smooth. Spread a thin film of CASCAMITE on the surfaces to be glued. Clamp and let set (at 70°F. or warmer) until glue is hard.

CASCAMITE is also recommended for laminating stock for table and chair legs, banisters, deep wooden bowls—wherever large dimensions discourage use of solid stock.

A "cinch" you'll prefer—CASCAMITE

Easy to mix. Just add CASCAMITE to cold water and stir.

Strong. CASCAMITE forms a bond stronger than the wood itself.

Thrifty tool! Mix CASCAMITE as you need it. No waste.

Get CASCAMITE urea-resin glue—and CASCO, the standard casein household repair glue, at your hardware store in 10¢, 25¢, and larger sizes. For outdoor and boat work, use CASCOPHEN, the new, completely durable, waterproof resorcinol-resin glue.

FREE GLUING GUIDE containing complete gluing directions plus helpful hints for household repairs. Free on request. Address a post card to Casein Company of America, Dept. PM-46, 350 Madison Avenue, New York 17, N. Y.



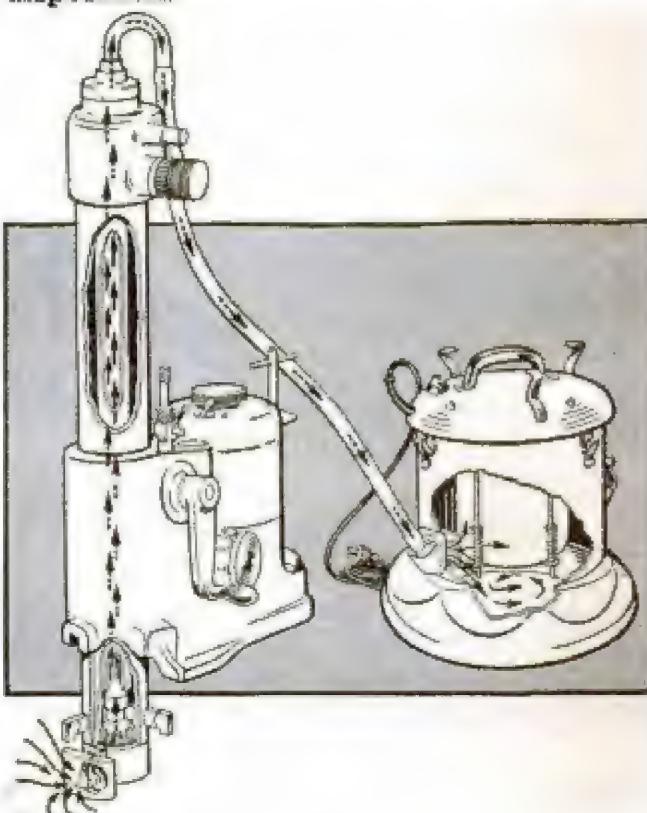
CASCAMITE

Dry Powder Urea Resin Glue



Shaking sharpens razor blades used in a new razor containing a hone, impregnated with diamond dust, hidden behind the blade guard. When the razor is shaken back and forth the hone flicks over the bottom blade edge on a pivot and sharpens it. A spring holds the hone against the blade with the necessary pressure. Any double edge blade fits the razor.

Vacuum removes metal chips as fast as they form during cylinder reboring. With suction centered around the tool bit, the chips are removed before they can drop into the crank case where they might otherwise cause damage. In addition, the circulating air keeps the bit cool and insures more accuracy in cylinder reboring. The chips then are collected in a container for easy disposition.



WORLD'S LOWEST PRICED ADDING MACHINE

VEST POCKET SIZE

IDEAL FOR BUSINESS OR PERSONAL USE

FREE TRIAL

ONLY \$2.50

TOTAL COST

SEND NO MONEY

Each Baby Calculator in Beautiful, rich-looking Leatherette case. Latino extra cost. FREE!!



Fits vest pocket or purse. Guaranteed accurate. Operated as easily, and as reliable, as machines costing many times as much. Not a toy. Substantially made of 28-gauge steel—guaranteed for life against defects in construction. You positively can't buy a calculator of equal quality for as little money. ACCEPTED AS THE FINEST LOW PRICED CALCULATOR FOR OVER 30 YEARS! Operates with a flick of your finger. Adds, subtracts, multiplies, divides—counts up to ten million. Pays for itself over and over in mistakes avoided, and time saved. MAKES IDEAL GIFT.

Sold on a positive money back guarantee. Send only \$2.50. Calculator sent postpaid, or send name and address and pay postman \$2.50 plus postage. MONEY BACK IN 10 DAYS IF NOT DELIGHTED! (If outside U. S. send \$3.00.) AGENTS WANTED.

CALCULATOR MACHINE CO. (Mfrs.)
Dept. 177, P. O. Box 248, Glenview, Illinois

Low Price

The OTTAWA "Buzz" Master



FREE Details

CLEAR LAND FAST! Powerful 6-HP motor with friction clutch for safe operation. Cuts down timber, brush and hedge; turn blade vertical; saw logs to length. Can be equipped to fell largest trees. Has clutch pulley for belt work; guaranteed.

OTTAWA MFG. COMPANY, 427 Brush Ave., Ottawa, Kans.



New - Improved
OIL FOR ALL ---

HOUSEHOLD-SPORTSMAN-MECHANIC
Lubricates - Prevents Rust - Cleans Metal

3 oz.
40c

FIEND OIL

PRESTO!

ANYONE CAN
MASTER GLAZE

GIVES HARD
GLASS-LIKE
FINISH.
EASY TO APPLY.
WILL NOT
THICKEN-
MARK.
EASY TO
KEEP CLEAR.
NO SMEAR OR STREAMS
AS WITH WAX.
LASTS SIX MONTHS
TO A YEAR.



SAVES YOU MONEY

Car Owners! Meet Master Glaze—the sensationnally different luster for new and used cars! Not a wax—not an oil polish—not a paint!—nothing that "smears" over the surface.

MASTER GLAZE is a unique discovery—a creamy liquid—quick and easy to apply! Gives a hard, glass-like surface. Even gasoline cannot dull it! Lasts six months to a year! Amazing luster—beautiful, sparkling clean and brilliant! Doesn't finger-mark—doesn't smear! A match box full glazes an entire car. Seals the pores—protects! NOTHING LIKE IT!

FREE SAMPLE

Just send your name and address today to
MASTER GLAZE CO., 7720-541 W. Harwood Ave., Milwaukee, Wis.

Build Things WORTH WHILE!



The LEJAY MANUAL has a Special Appeal for the Amateur Who Likes to Make Things that Work

FOR ONLY
\$1.50
WORTH
\$12.35

SHOWS YOU
HOW TO BUILD
TRANSFORMER
WELDERS

ELECTRIC
OUTBOARD

POWER TOOLS

LIGHT GENERATORS

INSECT
KILLERS

WIND PLANTS

ELECT.
GO-BIKE

ARMATURE WINDING

ELECTRIC
SCOOTER

ELECTRIC
FENCERS

TRACTOR
LIGHTS

MOTORS

AMAZINGLY SIMPLE PLANS
for PRACTICAL PROJECTS

You will have no trouble in working out the plans detailed in the LeJay Manual and you will get a lot of enjoyment from them. Whether or not you are mechanically inclined, the projects in these plans will appeal to you for their usefulness and practicability. They will save you money and make money for you, too, in jobs and repairs for neighbors and friends, because the plans embody all kinds of electrical devices.

NO EXPENSIVE TOOLS
or MATERIAL NEEDED

The tools you have around the house are all you need for these projects and most of the necessary material can be found around garages, workshops and scrap yards. Being able to make your own welder helps a lot in doing other jobs, and the LeJay Manual shows you how easy it is to do this. Also, how to make:

200 Amp. Generator Welders
Large Transformer Welders
Gunsmith's Carbon Welder
6, 12, 32, 110-Volt Motors
Electric Outboard Motor
Wind-driven Light Plant
Electric Fences
Electric Drills
Bench Grinders
Electric Scooter
Armature Rewinding
Insect Electrocutors
Electric Bicycle Pusher, etc.

SEND NO MONEY—BUT

Send a postcard with your name and address and a request to send the LeJay Manual C.O.D. and the postman will deliver it at your door. If you are not entirely satisfied after 3 days' perusal, send it back and we will refund the \$1.50. Bear in mind, however, that C.O.D. fees have been considerably increased, so if you prefer to save this expense, send \$1.50 now, under the same guarantee. In Canada, \$1.75.

LEJAY MFG. CO

47 LeJay Building
MINNEAPOLIS - 8 - MINN.

3 DAY
TRIAL

MAKE EXTRA PROFITS by Multiplying YOUR LATHE CAPACITY

CONVERT YOUR BENCH LATHE
FOR TURRET OPERATIONS WITH
Enco
MULTIPLE
TOOLHOLDERS
and Turn Your Hobby Into PROFITS!

For all bench lathes. Equip your shop for fast precision production. Do a greater variety of jobs in your work shop. These sturdy, versatile turrets mount on compound and tailstock. Together, they hold ten tools instead of two. Save 50% on tool changing time. Install quickly without machining.

ENCO Toolpost Turret

Model 234-S. Clamps rigidly in compound T-slot. 12-station, 30° indexing. Holds four tools. One tool performs three operations. Provides speedy set-up for threading. Made from solid hardened steel. Price (without tools) \$23.00



ENCO Tailstock Turret

Model A mounts six tools. Eliminates single chucking. For drilling, counter-boring, tapping, reaming, etc. Finger tip control. Price (without tools) \$18.95



**SPECIAL COMBINATION PRICE \$39.50
FOR SET OF TWO TURRETS**

ORDER TODAY... PAY THE POSTMAN

ENCO MFG. CO.
4522-24 Fullerton Ave.
Chicago, Illinois

Lathe.....
Swing.....

Please send me a PRODUCTION TOOL set C.O.D.—plus postage—for the lathe indicated above. (Postage prepaid, if remittance accompanies order).

Kindly mail illustrated leaflets describing ENCO Toolholders.

Name.....

Address.....

Town..... Zone..... State.....

Dealer.....

WRIST WATCHES!

Guaranteed

Send No Money



Thin Wafer Model

Special! Man's precision built wafer-thin chrome case watch, with stainless steel expansion wrist band. Red sweep second hand. Money back if not satisfied within 10 days. Send no money—mail coupon!

Radium Hand & Dial

\$12.95

Plus 10% Fed. Tax
Plus Postage

BURTON SALES CO., 809 W. Madison St., Dept. A-105, Chicago, Ill.

Please send watch as described. I will pay postman \$12.95 plus 10% Federal tax plus postage.

Name.....

Address..... City..... State.....

Clamp for Cables Slips On; Saves Drilling and Riveting



No hole drilling, riveting or welding is necessary to install one type of clamp for cables, conduit, pipe or wires. The clamp is located at the desired point on a hollow-square support member where it is fastened by tightening a single bolt. After the top part of the cable clamp straps are inserted between the overhanging lips of the support member, the insulating clamps are placed against the cable, the bolt is inserted and the nut turned up tight. The porcelain insulators are omitted for conduit or pipe.

Chrome-Finish Tire Paint Matches Trim of Car

Chrome-finish tire paint that matches the shining trim of most cars is now available. The new paint is said to be elastic to conform to the flexibility of the tire. Only one coat of the paint is required. It can be applied with either brush or spray.

WAR

SURPLUS BARGAINS

* * * * *

SENSATIONAL VALUES FOR QUICK LIQUIDATION

BOMB PARACHUTES



Of fine white nylon fabric 3 x 8 feet in diameter with split seam for directional dropping. Designed for dropping fragmentation bombs, emergency rations, etc. Each packed in a metal container. Weight 13 lbs. No. R-162 Each only... \$1.95

NEW SATCHEL POUCHES

Brand new shoulder type duffle bag pouches, ideal for luggage, school books, lunches, etc. Measures 11 x 12 inches. Of heavy canvas duck with taped edges. Weight 2 lbs. No. X-113 Each \$1.69



AIR CORPS PLASTIC FLASK SETS



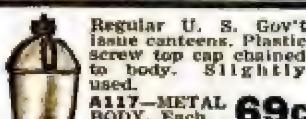
\$1.49

Two handy, transparent plastic flasks with canvas case. Used by the U. S. Air Corps. Holds any kind of liquid. Each flask measures 4 1/4 x 6 1/4 inches. Has clamp-on top plus screw cap. Fine for use on camping trips, picnics, etc. Weight 1 lb. No. R-178—Set only

MESS KITS



Regulation Army Mess Kits. Ideal for campers, boy scouts, etc. Slightly used but guaranteed perfect. Two pieces. Folding handle. A-116—Each... 69c



Regular U. S. Gov't issue canteens. Plastic screw top cap chained to body. Slightly used. A117—METAL BODY. Each... 69c

A118—PLASTIC BODY. Each... 69c

A109—Canteen Covers. New. Each... 69c

A119—Canteen Covers. Used. Each... 35c

A120—Canteen Cups. Used. Each... 25c

DIRECTIONAL COMPASS

For all outdoorsmen, boy scouts, etc. Liquid type, free acting and accurate. Gives direct reading. Tells you immediately what direction you are traveling. Plastic body measures 3 1/4 x 1 1/4 inches. Has waterproof compartment for matches.

No. R-208 Each only \$1.49



BOOBY TRAP FIRING PIN

Consists of trigger and trip arrangement with cord for remote firing control. Has powerful spring action. Ejects a pencil 8 to 10 feet. Has many uses such as burglar alarms, etc. Brand new! No. R-178 Each... 49c



POPULAR RECORD ASSORTMENT



This assortment of 50 records includes current dance, race, blues and hillbilly selections. These records have been used in juke boxes—but all are guaranteed perfect and playable. No two alike. Many famous name bands and artists included. Shipped express collect only—no exchanges, trades or refunds at this low price. Wgt. 28 lbs. No. A-303—50 records.....

\$9.64

DECORATIVE CHROME STRIPS

For your car, boat, furniture, etc. Highly polished chrome finished strips with clinched edges for flush mounting to any surface. The 3 pound kit provides approx. 43 pieces in lengths from 4 inches to 3 feet and 1/4 to 3/4 inches wide. Wgt. 4 lbs. No. R-224—3 lb. Assort. only... \$2.00



7-LB. EXPERIMENTER'S PARTS ASSORT.



A "gold mine" for the radio serviceman. Hundreds of valuable radio parts and electronic parts and sub-assemblies, coils, resistors, screw machine parts, etc.—worth many times this low price. A130R—7 LBS. \$1.79

PLASTICS—LUCITE AND PLEXIGLAS

In sheet form. Good workable sizes. Transparent. For costume jewelry, etc. Easy to work and polish. A280—3 LB. ASST.

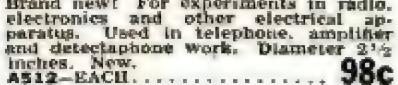
\$4.75

CATALAN—ASST. COLORS

Extruded shapes, rounds, half rounds, etc. Easy to machine. Furnished in assorted colors, shapes and lengths. A281—3 LB. ASST.

\$4.75

MICROPHONE BUTTON



Brand new! For experiments in radio, electronics and other electrical apparatus. Used in telephone, amplifier and dictaphone work. Diameter 2 1/2 inches. New. A512—EACH... 98c

AMMUNITION BOX



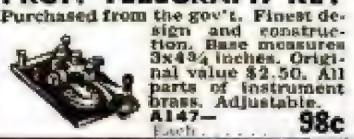
Fine for storing valuables, carrying lunches, etc. Of heavy gauge 7 1/2 x 11 x 4 inches. Fireproof. Hinged lid with folding handle. Olive drab finish. Used, but perfect. Shipping wt. 4 lbs. A525—EACH... 25c

BIG SHIPS BELLS



Purchased from U. S. Maritime Comm. Measures 10 inches high. 9 3/4 inch face. Big 6 inch clapper. Weight 15 lbs. Fine for farms, clubs, estates, etc. All new. Ship. wt. 10 lbs. A541—ONLY... \$9.85

PROF. TELEGRAPH KEY



Purchased from the govt. Finest design and construction. Base measures 3x4 3/4 inches. Original value \$2.50. All parts of instrument brass. Adjustable. A147—Each... 98c

MEDICAL STERILIZER

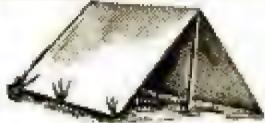


Consists of alcohol burner and sterilizing tray in hinged metal case 1 1/2 x 1 1/2 x 2 1/2 inches. Burner may be used separately. Bright nickel finish. All brand new. A125—Each... 98c

U.S. Govt. BOLO KNIFE

Extra heavy. For farm, home or jungle use. Blade of Govt. formula cutlery steel. Walnut riveted handle, 3 1/2 inch butt. 10 1/2 inch blade. You'll find hundreds of uses for a Bollo knife. Blade will take and hold a keen cutting edge. Wt. 2 lbs. A112—with Army Sheath... \$4.95

A212—Leather Sheath, extra... \$1.50



PUP TENTS

Regulation Army Pup Tents of durable, brown canvas. Used, but in good condition. Fine for campers, outdoormen, boy scouts, etc. Grand Xmas gift for children. \$3.95

A1—Tent Only... \$3.95

A110—Tent, new... \$7.95

A101—Ropes, wooden poles and stakes for above. Per set... \$1.00

ARMY BANDOLEERS



Of fine heavy khaki. Big roomy pockets with snap button fasteners. Fine for hunters, campers, boy scouts, etc., also for shop work in carrying small parts, etc. Material alone is worth this price. 11 Pocket Type No. 129 49c 5 Pocket Type No. 110 29c

ORDER DIRECT FROM THIS AD

Values galore! Hundreds of hard-to-find items for home, shop and outdoors. Make remittances by money-order, bank draft or personal check. Send 25% deposit on C.O.D. orders. No C.O.D.'s on orders for less than \$5.00. Include sufficient postage on parcel-post orders—any overage will be promptly refunded. All quotations F.O.B. Chicago. Used items and materials are guaranteed serviceable and as described. Your money back if not more than satisfied.

BIG ILLUSTRATED CATALOG FREE

STARK'S

Dept. PM446
509 So. State St.
CHICAGO 5, ILL.

STILLS

Distill your own water with one of these fine portable stills. Purchased from the Gov't. Completely self contained. Has 1 gallon capacity; output 1 1/2 gal. per hour. Fitted with genuine Coleman double burner stove. Operates to 7 hrs. on one filling. Heat output 20,000 BTU's. Stove alone is worth this price. All new and guaranteed. Instr. included. Weight 100 lbs. No. 2064 \$59.50

10**ASSORTED CUTTERS****\$4.95
ONLY****100 ASSORTED \$45****JARVIS & KELLER****HIGH SPEED MIDGET MILLING CUTTERS
& ROTARY FILES - NEW & RECUTS**

Great for die makers, mechanics, repair men — for routing, deburring, grinding. Used in drill presses, electric hand drills and hand grinders. Worth \$1.50 to \$3.50 each at original list price. Satisfaction guaranteed. Immediate shipment subject to prior sale and quantity now on hand. Going fast, order at once to insure delivery. Send check or money order to

UNITED LAMP CO.

3811 E. 67th ST.

KANSAS CITY 3, MO.

The O'BRIEN ALL-STEEL HYDRAULIC BUMPER-JACK

*Built
to Lift
2 Tons
• • •*

With Finger-Tip Pressure

LATEST, FINEST ENGINEERED, MOST

- 1—All Steel Construction.
 - 2—Solid Steel Piston—
3 Telescoping Steel
Tubes Quadruples
its strength.
 - 3—Adjustable Hook—
Over 15 inch range.
 - 4—Finger Pressure Hy-
draulic Stroke.
 - 5—No Screw Parts To
Rust.
 - 6—17½ inch Hydraulic
Hoist.
- A
LIFE-TIME
ACCESSORY
• • •

LIFETIME GUARANTEE AGAINST
DEFECTS. PERFECT WORKMANSHIP.

\$12.50

If your dealer can't supply you,
remit \$12.50 and we will ship
immediately. Money cheerfully
refunded if not satisfied.

Plus 50c
Postage
in U.S.A.

Wanted: DEALERS-AGENTS

AUTO PRODUCTS CO.

Dept. P-4

6349 N. Clark St., Chicago 26, Ill.

Chessmen Made of Used Shells



Salvaged .45-caliber and .50-caliber ammunition cases were used by Lieutenant George A. Lundburg to form an unusual set of chessmen during his off duty hours while he was stationed in the Solomon Islands. Pawns of the set are .45-caliber cases. Other pieces are .50-caliber cases. He spent 50 hours in making the set.

Cigar-Size Pneumatic Tool Drives Small Screws

Manufacture of radios, cameras and other products that use screws is speeded by an air-driven screwdriver about the size of a cigar. Weighing only eight ounces, the pneumatic tool handles screws from No. 1 size to No. 6. It starts automatically when applied to work and adjusts itself to various driving conditions. The operator increases pressure slightly as larger screws are encountered. The tool has a rotary-type motor, four-blade construction, ball bearings throughout and hardened and ground steel rotor and cylinder.



IDEAL FOR Auto-Home Appliance and Farm REPAIRS

Now A DYNAMIC **HEAVY DUTY INDUSTRIAL WELDER**

Available Now Without Priorities!

Designed to Do High-Grade Welding Inexpensively

Maintenance men, farmers, mechanics, machine shops, foundries, auto, general repair and job welding shops using the DYNAMIC WELDER find it so indispensable and useful that they cannot afford to be without it. If inexperienced you can easily learn to do a variety of high-grade welding jobs by following the practical, simplified operating and welding instructions furnished.

WORKS ON IRON, STEEL, BRASS, BRONZE and OTHER METALS

Has eight metallic and carbon arc welding heat stages. Does work you would think only possible with a larger, more expensive machine.

READ WHAT USERS SAY...

Repair Shop Owner says, "It will do more than you say"

"I want to say I operate a repair garage and am more than satisfied with the welder. It will do more than you say." C. P., Butler, Ohio

It's the Greatest Portable Outfit

"Now I am equipped for all kinds of welding and I must say it's the greatest portable outfit for welding any man could ever wish to own. I wouldn't sell mine for the cost of plenty welders I have seen which were very high in cost but not in convenience. You may put me on file as a booster of your wonderful welding product." W. J. B., St. John, N. B., Canada

Better Than I Expected

"I have done quite a little welding with my welder and will say it is better than I expected. The price, convenience, and variety of work that can be done with the Dynamic are the attractive points." W. R. P., Portland, Ore.

EASY TO OPERATE!

DYNAMIC SUPERCHARGED WELDER

GET DETAILS ON OUR 10-DAY TRIAL OFFER!

Once you see a DYNAMIC in operation you won't want to be without it. Its simplicity will amaze you. In a year the DYNAMIC only costs you about 6c a day. Comes complete, ready to operate, with helmet, rods, cables, electrode holder and operating instructions, etc. Nothing else to buy. Write today for Free particulars. Act now and get details on our amazingly low priced Dynamic Welder and 10 day trial offer.

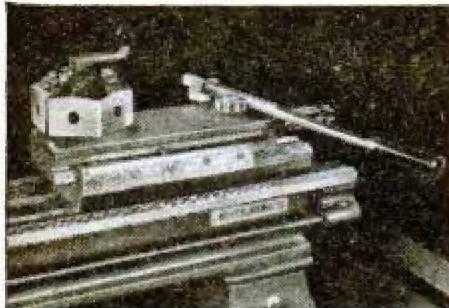
DYNAMIC WELDER CO.

13 East 23rd Street—FD

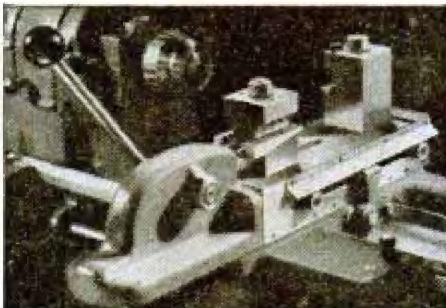
CHICAGO 16, ILLINOIS

MORE VERSATILITY

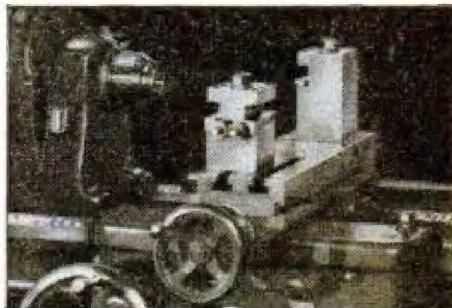
FROM SOUTH BEND LATHES WITH THESE ATTACHMENTS



Handlever Bed Turret for 9" or 10" lathes multiplies their versatility through multiple tooling for repetitive operations.



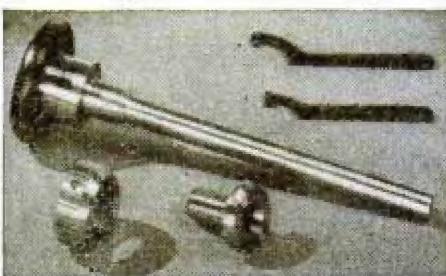
Handlever Double Tool Cross Slide for 9" or 10" lathes speeds up successive operations through the use of three cutting tools.



Screw Feed Double Tool Cross Slide for 16" lathes has both manual and power cross feed. Large graduated feed dial.



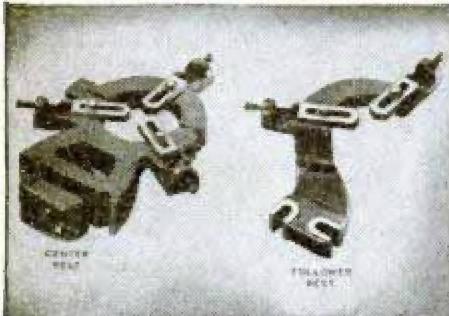
Handlever Draw-in Collet Attachment saves time on bar work. Collet can be operated and stock fed without stopping spindle.



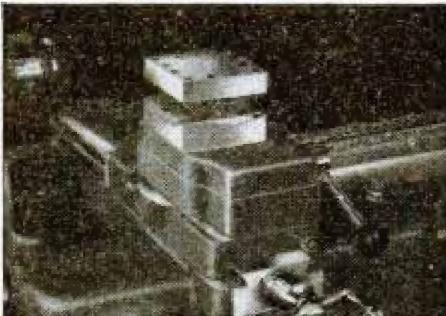
Handwheel Draw-in Collet Attachment is ideal for production and toolroom work that requires extremely close tolerances.



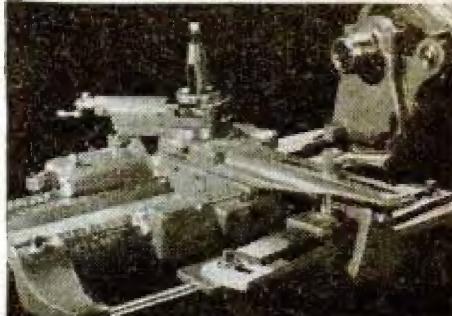
Collets from $\frac{1}{16}$ " to 1" in $\frac{1}{64}$ " steps. Complete sets of collets will save time.



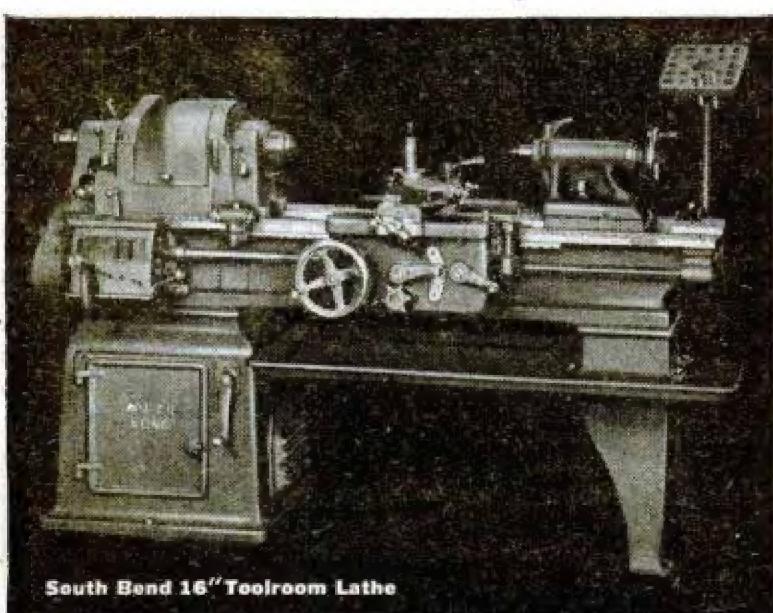
Center Rest and Follower Rest for supporting long bar work while turning, threading, drilling, boring, etc.



4-Way Turret Tool Block permits use of four cutting tools which simplifies tooling for repetitive operations.



Taper Attachment for accurate taper turning and boring. Quickly engaged. Graduated in both degrees and taper per foot.



South Bend 16" Toolroom Lathe



SOUTH BEND LATHE WORKS

Lathe Builders Since 1906
455 E. MADISON STREET, SOUTH BEND 22, INDIANA

Printed by Popular Mechanics Company, Chicago, Ill., U. S. A.

You look **SHARP**

because you get the
best-looking Shaves
any man ever had!

} look



SHARP

You feel **SHARP**

because Gillette Blue
Blades give you the
quickest, most refresh-
ing shaves of your life!

} feel



SHARP

You are **SHARP**

when you buy
Gillette Blue Blades
with the **SHARPEST**
edges ever honed,
because you get more
shaves per blade and
save money!

} be



SHARP

use
Gillette
Blue Blades

with the **SHARPEST** edges ever honed!

Copr. 1946 Gillette Safety Razor Co.



GILLETTE'S CAVALCADE OF SPORTS presents
the major boxing event of the week every Friday night over
American Broadcasting Company stations at 10 o'clock E.S.T.
Gillette Safety Razor Company, Boston 6, Mass.

There is a Doctor in the House



—and it took
a minimum
of \$15,000
and 7 years' hard
work and study
to get him there!

PROUDLY he "hangs out his shingle," symbol of his right to engage in the practice of medicine and surgery. But to a doctor it is more than a right: it is a privilege—the privilege of serving mankind, of helping his fellow man to a longer, healthier, and happier life.

R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

According
to a recent
Nationwide
survey:

MORE DOCTORS SMOKE CAMELS THAN ANY OTHER CIGARETTE!



FAMILY physicians, surgeons, diagnosticians, nose and throat specialists, doctors in every branch of medicine... a total of 113,597 doctors... were asked: "What cigarette do you smoke?"

And more of them named Camel as their smoke than any other cigarette! Three independent research groups found this to be a fact.

Next time, get Camels. Compare them in your "T-Zone."



The
"T-ZONE" Test
Will
Tell You

The "T-Zone"—T for taste and T for throat—is your own laboratory, your proving ground, for any cigarette. For only your taste and your throat can decide which cigarette tastes best to you... and how it affects your throat.

CAMELS *Costlier
Tobaccos*